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No. 13

SHIPS FOR THE STEEL COMPANIES.

THE BIG INDUSTRIAL COMBINATIONS ARE PROVIDING STILL FURTHER FOR THE
TRANSPORTATION OF THEIR ORE—SIGNIFICANCE OF THE
SALE OF WOLVIN SHIPS.

The vessel owner of the lakes who has no connection with producing or consuming interests in iron ore attaches considerable significance to the sale, within the past few days, of seven steel steamers, known as the Wolvin fleet, to two of the big steel combinations. This purchase means first that the steel interests are willing to pay high prices for modern freight carriers in order to immediately strengthen themselves in the struggle that is going on for industrial supremacy. It means also that the transportation of ore, alike to other branches of the iron industry, is to be eventually controlled by the combinations to a far greater extent than was expected a short time ago. The important question, therefore, with the vessel owner who has a few modern steel freighters, and who could now find a sale for them at profitable prices, is whether it would be to his advantage to sell out on the present rise in values, or continue in the business with the hope that the combinations will not last, or that there will always be a place for the individual owner who keeps up with the times by selling off old ships and building a few new ones from year to year.

Although it was at first thought that the entire Wolvin fleet of seven steel steamers would go to the Federal Steel Co., only two, the Pennsylvania and Texas, building at Lorain, went to that interest. The premium paid for the transfer of contract covering the construction of these two vessels has not been made public, but it is understood that stockholders in the Zenith Transit Co., owning the five vessels sold to the American Steel & Wire Co., were paid \$125 a share for stock that cost them \$100 a share. It is still generally understood that as a result of this sale, Mr. A. B. Wolvin will quit the lakes and undertake for the Great Northern Railway the establishment of a steamship line on the Pacific, between Puget Sound, China and Japan, but Mr. Wolvin has not said as yet that his mind is fully made up on this score. If he should take up this project for the Great Northern, his first year in the undertaking would very probably be spent in Europe planning for the construction or purchase of the five or six big steamers that would be required for the service. The offer for his services is said to involve a salary of \$25,000 a year and a contract covering a term of five years.

Reports of additional lake freight contracts are based simply upon talk of what might be done if vessels were offered to the coal or ore shippers. It is reasonable to suppose, of course, that ore shippers would pay a marked advance over the 60-cent contract rate, in the acceptance of which everybody made a mistake, but it cannot be learned that a contract of any kind has been made for six weeks past. The ideas of such of the vessel owners as are not tied up to contracts are so high that thus far the ore shippers seem satisfied to take the chances of wild rates on the ore not covered. The same is true of the soft coal shippers, but it must be admitted that there is considerable anxiety on the part of both of these interests, especially in view of the indications of a very late opening of navigation and the prospects of a heavy spring movement of grain. Lake freight conditions are all favorable to the vessels, big and small, and the situation seems to grow stronger all the time.

END OF ANOTHER COLLISION CASE.

The litigation growing out of the collision between the steamers Maurice B. Grover and John V. Moran, May 7th, 1896, has finally terminated in complete exoneration of the Grover. The Moran was aground about 300 feet below the light crib at Sailors' Encampment, St. Mary's river. About 7 o'clock in the evening, the Grover came down and collided with her, striking her near amidships. The Moran had her running lights up and had been endeavoring to release herself, and, as the Grover was coming down from the turn above, the Moran blew four whistles to a tug for assistance, which were heard on the Grover and taken for a hurry-up signal. The Grover first endeavored to pass under the stern of the Moran, and seeing she could not do that, changed her course to go around the bow, but unsuccessfully.

The case was tried in the United States district court at Utica before District Judge Cox, who exonerated the Grover. His decision was affirmed by the United States circuit court of appeals, and the application of the Moran for a rehearing denied by that court. Both courts found that even if the Grover could have passed the bow of the Moran, had she tried it in the first place, it was not a fault for which she could be condemned, as the Moran presented every appearance of a vessel waiting below. She gave no warning of any danger or anything unusual in the situation, and after the Grover ascertained that she was not moving, although she had her running lights up, but was aground, a mistake in judgment, if one were made, by her master, was not a fault for which she could be condemned.

Although the work of inspecting vessels for the Tonawanda Iron & Steel Co. was begun only a few days ago, and there is nothing positive yet as to what ships will be taken, it is more than probable that when Mr. Rogers concludes his purchases the list will include the steamers Quito, Gratzwick, Veronica, Volunteer, V. Swain and Spencer, and barges Pennington, Amboy and 101. It is reported from Buffalo that W. C. Blodgett, Buffalo manager of the coal interests of the New York, Ontario & Western Railroad, has bought the Metacomet and J. H. Rutter, as they lie frozen in at Valleyfield on the St. Lawrence. They will be taken to the coast and run in the company's coal trade there. The recent sale of a controlling interest in the steamer Centurion to Mr. W. G. Mather of Cleveland, was on a basis of about \$160,000 for the entire vessel.

MONTREAL ELEVATOR PROJECT.

SOMETHING ABOUT THE PLANS OF W. J. CONNERS AND OTHER VESSEL OWNERS
OF BUFFALO AND CLEVELAND TO TAKE ADVANTAGE OF THE
ENLARGEMENT OF CANADIAN CANALS.

Not much is being given out regarding the plans of W. J. Conners and other vessel men of Buffalo and Cleveland for the erection of grain elevators and steel freight houses at Montreal, but it is generally understood that the scheme is one of considerable magnitude and contemplates the through shipment of grain from the northwest to European points by way of the enlarged St. Lawrence canal route, the proposed new company to not only provide extensive terminal facilities at Montreal, but to also undertake the transportation of grain, flour, etc., up to the time of delivering it to seagoing vessels at Montreal. Reports of the first visit of Attorney Harvey D. Goulder of Cleveland to Montreal in the interest of the proposed company indicate that the harbor board of that city is disposed to grant a part of what is asked for in the way of leases of wharf property, reduction of wharfage charges, etc., but as this was only a preliminary meeting there is no telling as yet what may be expected of either party to the negotiations. The project is, of course, dependent upon the position taken by the Montreal officials. As yet they do not seem disposed to grant anything like what is wanted by Mr. Conners and his associates, and negotiations are therefore temporarily suspended until the return of Mr. Conners from Hot Springs, Ark.

It is generally understood, both in Canada and the United States, that if full advantage is to be taken of the enlarged St. Lawrence canals when they are completed next year, and if Canada is to get its share of the export trade in grain and flour over this route, the facilities for transfer of these commodities to ocean vessels at Montreal must be greatly improved and a thorough organization also effected in the matter of lake vessels suited to the Canadian canal trade. This is what the new company proposes to do. Their plan is to give to Montreal the advantage of such elevator and dock facilities as now prevail at Buffalo; this to be done, of course, by the organization of a company in Canada and by the co-operation of Canadian interests with the gentlemen of Buffalo and Cleveland who propose to furnish capital for the enterprise. It is said that Mr. Conners is himself ready to put \$200,000 into the scheme at once, and that the first move would be the erection of a 3,000,000-bushel steel elevator at Montreal.

The request made to the Montreal harbor board by Mr. Goulder indicates the extent of plans for elevators and steel freight sheds at that point. Leases extending over ninety-nine years are asked for on three sections of water front property, one of 1,200 feet and another of 2,000 feet, as well as a large pier in the eastern end of the harbor, which the commissioners contemplate erecting. The company evidently looks for a big business eventually, as the tonnage figures which they submit regarding wharfage charges are up in the hundreds of thousands. They propose, for instance, that upon the freight they handle the wharfage charge "shall not exceed 5 cents per ton up to 250,000 tons, and if we should exceed that amount in any year, the wharfage charge shall not exceed 2½ cents per ton, on the amount of freight actually handled, this reduction to go into effect when we actually begin handling freight, but thereafter due effort to be made to abolish or further reduce the charge as much as possible."

NORTHWESTERN GRAIN SITUATION.

Duluth, Minn., March 29.—One of the leading vessel agencies sends out the following letter as to the grain situation in the Northwest:

"All Granger railroads entering here have published notices to the effect that they will no longer receive in the country grain consigned to Duluth and Superior. This explains the situation in a nut shell. Twenty million bushels of grain are in store here awaiting shipment, against eleven millions at this time a year ago. It is a little difficult to determine what per cent. of this grain will seek a market promptly at the opening. The extensive demand for flax leads us to believe it will be rushed forward at the earliest opportunity. Doubtless also oats and barley will move promptly. We understand that about half the corn is to go forward, while the activity in wheat will depend entirely on the market conditions. The inquiry for our wheat in the east has been extremely limited, but it seems reasonable to assume there will be extensive chartering shortly. Shippers will undoubtedly have to pay 2½ cents whenever they again enter the market seriously. As stated in our last letter regarding lake freights, the supply of anthracite coal is exhausted, while the stocks of bituminous coal are much smaller than a year ago. The temperature for the week has been just about the freezing point, so that the ice has not been affected to any perceptible extent."

Three or four representatives of the Cramp ship yard, Philadelphia, have been visiting lake yards within the past few days in company with Mr. J. W. Duntley of the Chicago Pneumatic Tool Co., who is desirous of having them see the extent to which pneumatic tools are used in lake yards, not only for deck and interior work but also for shell plating.

Commander S. M. Ackley has been detached as naval secretary of the United States light-house board and ordered to command the Concord. He is to be succeeded immediately by Capt. T. Perry, detached from command of the Lancaster.

A GREAT SHIP YARD.

IN THE WORKS AT NEWPORT NEWS THE UNITED STATES NOW HAS ONE OF THE LARGEST INDUSTRIAL ESTABLISHMENTS OF ITS KIND IN THE WORLD—SOMETHING ABOUT THE FOUNDER OF THE PLANT, COLLIS P. HUNTINGTON, AND ITS RAPID DEVELOPMENT.

FULL DESCRIPTION OF THE MANY DEPARTMENTS.

MORE WORK ON HAND THAN IS TO BE FOUND IN ANY OF THE GREAT SHIP YARDS OF EUROPE—VESSELS AGGREGATING 100,000 TONS AND VALUED AT \$18,500,000 UNDER CONSTRUCTION.

Industrial institutions, alike to individuals, are distinguished by their achievements, and it is not surprising, therefore, that in these days of the upbuilding of the American merchant marine and a new navy in the United States the eyes of the world should be turned upon the great plant of the Newport News Ship Building & Dry Dock Co. at Newport News, Va. That an institution whose very inception dates only from 1888 could, within ten years from that date, have under contract more new ships for both navy and merchant marine than any other ship building concern in the world is of itself sufficient to rivet the attention of all sharers in that admiration for energy and daring of accomplishment which is so general at the end of the century. Many circumstances and conditions which it is not necessary to enumerate here have enabled the Newport News works to hold always for European students of naval architecture a greater interest than any other ship building institution in America. This interest is in part explained by general recognition of the fact that there is not on the globe a plant that can compare with these works for completeness of equipment.

The works of the Newport News Co. represent today an investment of close onto \$10,000,000. It is doubtful if there is anywhere on earth a ship yard which in area exceeds its aggregate of 120 acres with over a mile of water front, and the most competent judges of Europe and America have agreed that its equipment of tools and machinery and methods of handling material is not, for economy and expeditiousness, equalled anywhere. The Newport News yard is unique in too many respects to make enumeration possible, but yet another one is worthy of mention. In no other enterprise of equal magnitude in America was its founder ever so completely in touch with every detail of development during the entire formative period. The work of Mr. Collis P. Huntington in this particular was nothing short of marvelous. Indeed the business world of the United States has within its history held no more striking figure than that of the great railway magnate, responsible in every detail for the inception and establishment of the Newport News yard, and it will therefore be no digression to preface any description of the yard with a brief sketch of its founder, of whose ideas, indeed, it is the very embodiment.

Collis P. Huntington was born in Harwinton, Conn., in 1821 and grew up on a farm with only such limited educational opportunities as fall to the lot of the average country boy. He was scarcely fifteen years of age when he started out to carve his fortune and within half a dozen years he had earned sufficient money to, as he expresses it, "buy three farms of the size of the one I grew up on." At sixteen years of age he went to New York city and a few years later entered the general merchandise business with his brother, with whom he remained several years. The gold fever of 1849 found the young man embarked for California via the isthmus of Panama, not as a victim of the gold mining craze but keenly alive to the possibilities of development in other lines, which would follow in its wake. He was detained for three months on the isthmus, but finally reached California and entered the hardware business in partnership with Mark Hopkins, and it is perhaps interesting to note that Mr. Huntington still retains his interest in the house thus established.

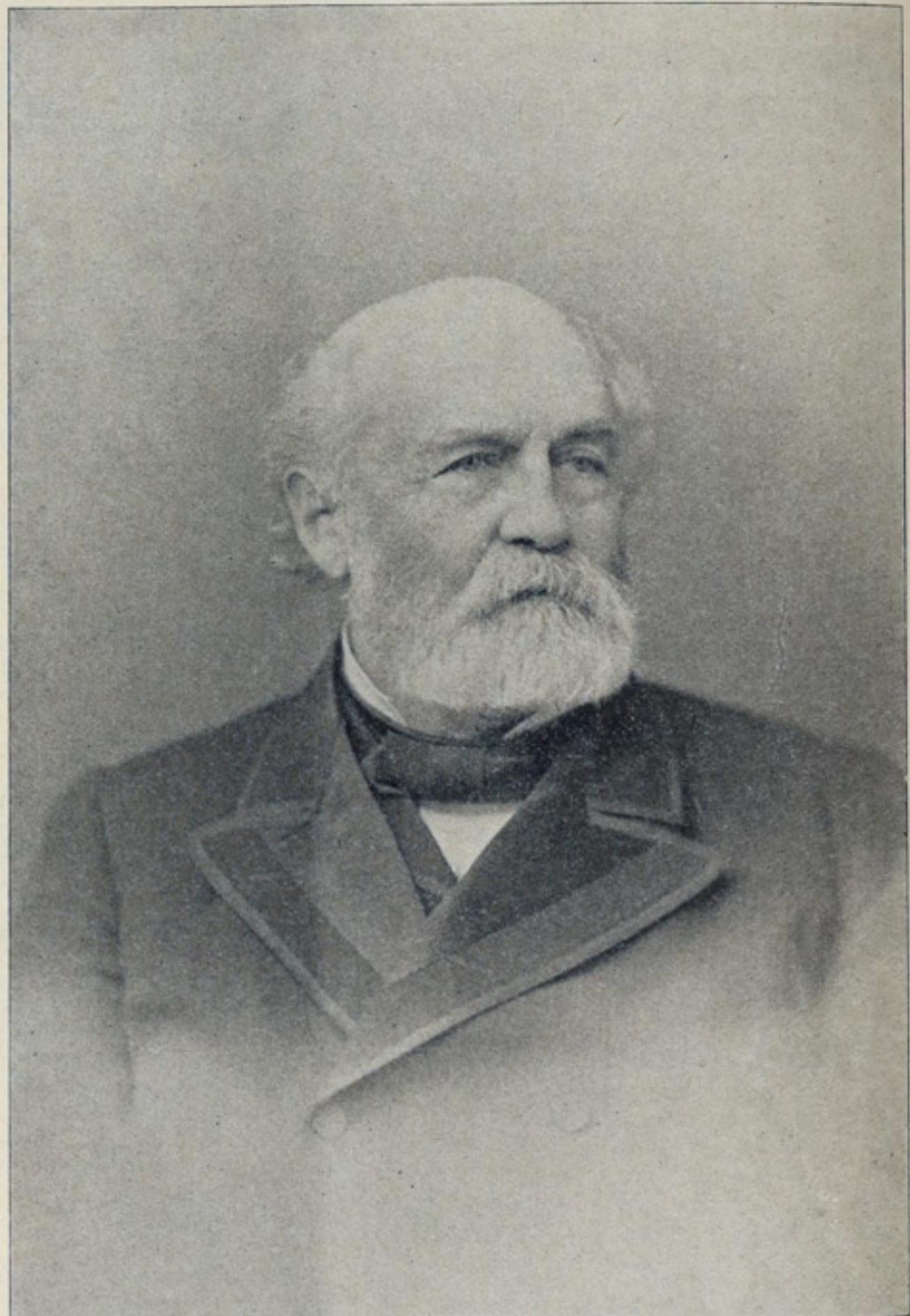
When the project for the construction of a railway from the Missouri river to the Pacific coast was broached, Mr. Huntington was one of the first to look into the matter and to appreciate, after a thorough study of the situation, its numerous advantages. He and his partner, Mr. Hopkins, went into the scheme with energy and enthusiasm and they succeeded in interesting a number of men of more or less prominence, among whom were Leland Stanford and Charles Crocker. A preliminary organization followed soon after and served to enable the collection of a fund for a survey of a route over the mountains. The practicability of the project was conclusively demonstrated by this survey, and the preliminary organization was made the foundation for the corporation which afterwards became the Central Pacific Railroad Co. The difficulties encountered in the construction of the line were innumerable, and for a time seemed insurmountable, but they were finally overcome and on May 10, 1869, the road was completed to Ogden, Utah.

The insight which the railroad builder had gained into the situation during the construction of the Central Pacific brought home to him with force the advantage and ultimate necessity of a southwestern line to New Orleans. The same interests were marshaled for the construction of that line, and the outcome of Mr. Huntington's famous contest with Tom Scott in building the road across the state of Texas added to his fame. These achievements, long regarded as the most wonderful of the century, were, however, only the commencement of Mr. Huntington's career as

a railroad builder. Under his magic direction there grew in succession the Chesapeake & Ohio, Chesapeake & Southwestern, Kentucky Central, Elizabethtown, Lexington & Big Sandy and the Louisville, New Orleans & Texas, until finally Mr. Huntington was enabled to ride on his own railroad tracks from the Atlantic to the Pacific ocean, a feat which has never been possible of accomplishment to any other man.

The wonderful foresight of this head of gigantic enterprises was demonstrated in his selection of Newport News, Va., as the site for the ship yard which he had determined from the inception of the idea was to be the model institution of its kind in the world. In 1837 Mr. Huntington visited Newport News for the first time. The advantages of the location impressed him then and continued so indelibly fixed in his mind that when his extensive rail transportation interests and his steamship interests on the Pacific brought to his mind the question of the advisability of adding thereto a ship yard, his thoughts naturally reverted to Newport News as the best available site.

It is indeed an ideal ship yard, ideally located. With unlimited territory for the arrangement of a yard, and with the finest natural harbor in America, the depth of water ranging from 35 to 55 feet at the ends of the ship yard piers, it will be seen that the field was most admirably adapted for utilization to the best advantage of man's ingenuity. The plan followed by Mr. Huntington in the conduct of operations incident to the establishment of this great institution was in a measure unique and would indeed be adopted probably by but few men under similar circumstances, were they engrossed with as many other interests as he. Mr. Huntington



MR. COLLIS P. HUNTINGTON, FOUNDER OF THE NEWPORT NEWS CO.

has, however, made it one of the cardinal principles of his life that no man shall know his business more thoroughly than he, and this, combined with his adherence to the old theory that to insure a thing being done well you must do it yourself, constitute ample explanation of the manner in which he kept in touch with every detail of the establishment of the great plant. The founder of America's largest ship yard is not a close follower of the plan of continual personal inspection. The number and diversity of his interests has made that impossible, but nothing surpassed the keenness of his observation during his occasional visits, and quite comparable with it was his vigilance regarding the manner in which the work at the yard was directed from the New York office.

Mr. Huntington is a broad man and he has conducted his ship yard on the broadest of principles, which at the same time embody as one of their characteristics an unusual degree of foresight. He has stated that he would rather lose \$100,000 in a year of business depression than turn the force of more than 5,000 men employed at the ship yard adrift, and this statement was, as he explained, not induced by sentiment but by hard business discernment, appreciative of the difficulty of gathering anew a force of the skill of that now installed at the Newport News yard. In exemplification of his belief in this policy, Mr. Huntington's action

during the panic of 1893 may be cited. Rather than turn adrift then the men employed at his yard, he took contracts for three vessels, anticipating a loss thereon of \$50,000, and upon which he did actually lose \$60,000. In another instance the profit on a \$2,000,000 ship yard contract amounted to only 3 per cent. The policy of this employer of 100,000 men is, however, to work by decades. His computations of profit and loss are made not at the end of one year but at the end of ten, and he states that so far has he been justified in the adoption of this plan, that in the seventy years during which he has been saving money there has not been a single instance when the close of a decade has not found him with a substantial profit from the business conducted therein.

The founder of the Newport News ship yard was more than fortunate in the selection of a man to assume the active direction of all the operations incidental to the conduct of the plant. President C. B. Orcutt of the Newport News Ship Building & Dry Dock Co. was responsible, not only for the management of affairs during the years from 1888 to 1890 when the yard was in process of establishment, but since that time as well. Mr. Orcutt makes his headquarters at the main office of the company, No. 1 Broadway, New York, but he makes frequent trips to the yard and keeps very thoroughly in touch with affairs there. The active direction of affairs at Newport News, in accordance with Mr. Orcutt's

were, a common destination. To this end the ship shed, framing shed and other kindred departmental buildings are grouped around the stocks where the new vessels are under construction, while the blacksmith, boiler and joiner shops form another group, and the structures wherein repair work is conducted surround the dry dock. Of what might be called the incidental facilities of the yard, such as the traveling cantilever cranes, and the 150 ton derrick, more will be said later, although passing note should be made of the very complete railroad system within the yard, which embraces several miles of track on which a locomotive owned by the company is constantly in service. Railroad facilities for the transportation of material to the yard are unexcelled. The Chesapeake & Ohio has a branch line direct to the works and ample provision of tracks for switching and storage is made. One of the influences that contributed to the selection of Newport News as a site for the ship yard was the accessibility of cheap fuel, and this coal, which is of the excellent grade, to be found along the line of the Chesapeake & Ohio, is of course brought direct to the yard in the cars of that line. Such material as ship plates, beams and channels, etc., most of which comes from the Carnegie works at Pittsburg, is, as a rule, unloaded by means of a 5-ton locomotive crane.

In a tour of these works starting from the upper end the visitor



WATER FRONT AT THE NEWPORT NEWS YARD AND SHIP BUILDING PLANT FROM THE MAIN GATE.

suggestions, was during the latter part of 1891, placed in the hands of Mr. Sommers N. Smith, of Philadelphia, a ship builder of wide experience, and he was succeeded after some years by Mr. Walter A. Post. Each gentleman has held the position of general superintendent, or as it is sometimes designated, assistant to the president.

A TOUR OF THE ENTIRE WORKS.

EXHAUSTIVE DESCRIPTION OF THE VARIOUS DEPARTMENTS, FOLLOWING MATERIAL FROM ARRIVAL IN THE YARD UNTIL IT IS PLACED IN THE SHIP—TOOLS FROM ALMOST EVERY MANUFACTURER IN THE COUNTRY—NEW DRY DOCK TO COST A MILLION.

It is safe to say that the visitor to the great plant at Newport News if he be a ship builder or conversant to any extent with the technical side of the industry, will be most impressed by the perfection of every detail of the system for securing the maximum degree of economy of time, labor and material. When these works were first projected a number of the men who were to be placed in charge of departments were sent to Europe to study methods in vogue there. Judged from one standpoint it was an expensive proceeding, but considered from another it demonstrated anew the wonderful foresight of Mr. Huntington. These men returned brimming with the results of observation, which, assimilated with their natural fund of American inventive genius, resulted in the presentation of ideas of such striking and readily apparent merit as to command their adoption at once. The result was the establishment of a ship yard which in the matter of convenience, speed and economy in the conduct of its operations has no peer anywhere in the world. Yet for all that, the plan is simple in the extreme. It is based on the continuous, unretarded movement forward of the material from the time it enters the yard in the raw state until it is ready to leave as part of a completed ship.

The material has two starting points, one in the hull department and the other in the department of boilers and machinery, but reaches, as it

comes first to the bending shed, which, in connection with other kindred departments to be hereafter mentioned, is in charge of Mr. J. T. Hughes as foreman. This bending shed—it is about 75 x 120 feet in size—has a regular complement of thirty men. Among the machinery is an 18-foot garboard bending and flanging machine, furnished by Bement, Miles & Co. of Philadelphia, which has a capacity for flanging at right angles, cold $\frac{3}{4}$ -inch plates, and is adjusted by hydraulic power under 1,500 pounds pressure. The angle furnace is 60 feet in length and there is a plate furnace 22 feet in length by 7 feet in width for stern plates, and a small furnace 9 x 4 feet in size for small angle work. One of the most recent installations in this department is a ground heating furnace, 25 feet in length, and in which a fire any size from 1 to 25 feet may be made. This furnace is of use for working material which after flanging is not of correct shape after the first heat, and yet can not be placed in the regular furnace again because of the shape. The shed is also equipped with a 3-ton hydraulic crane for handling plates at the flanging machine.

The framing shed is a wooden structure of about 270 by 344 feet. The equipment includes eight angle machines manufactured by the Long & Alstatter Co. of Hamilton, O., and which punch holes ranging from $\frac{1}{4}$ to $1\frac{1}{8}$ inches in size in plate varying from $\frac{1}{4}$ to $\frac{3}{8}$ inches in thickness; one Hilles & Jones angle puncher, punching $1\frac{1}{8}$ inch hole in $\frac{1}{4}$ to $\frac{7}{16}$ -inch plate; three horizontal angle punchers of the Long & Alstatter make, capable of punching 1 1-16-inch holes in plate varying from $\frac{1}{4}$ to $\frac{3}{4}$ inches; two small Long & Alstatter plate punchers for 1 1-16-inch hole in $\frac{1}{4}$ to $\frac{5}{8}$ -inch plate; one Hilles & Jones angle cutter with a maximum of angles 7 by 7 by 1 inch in thickness; an old angle cutter capable of taking angles 6 by 6 inches by $\frac{5}{8}$ inch in thickness, and an angle cutter of William Sellers & Co. manufacture for angles 12 by 12 inches by $1\frac{1}{4}$ inches thickness.

SOME VERY HEAVY MACHINERY.

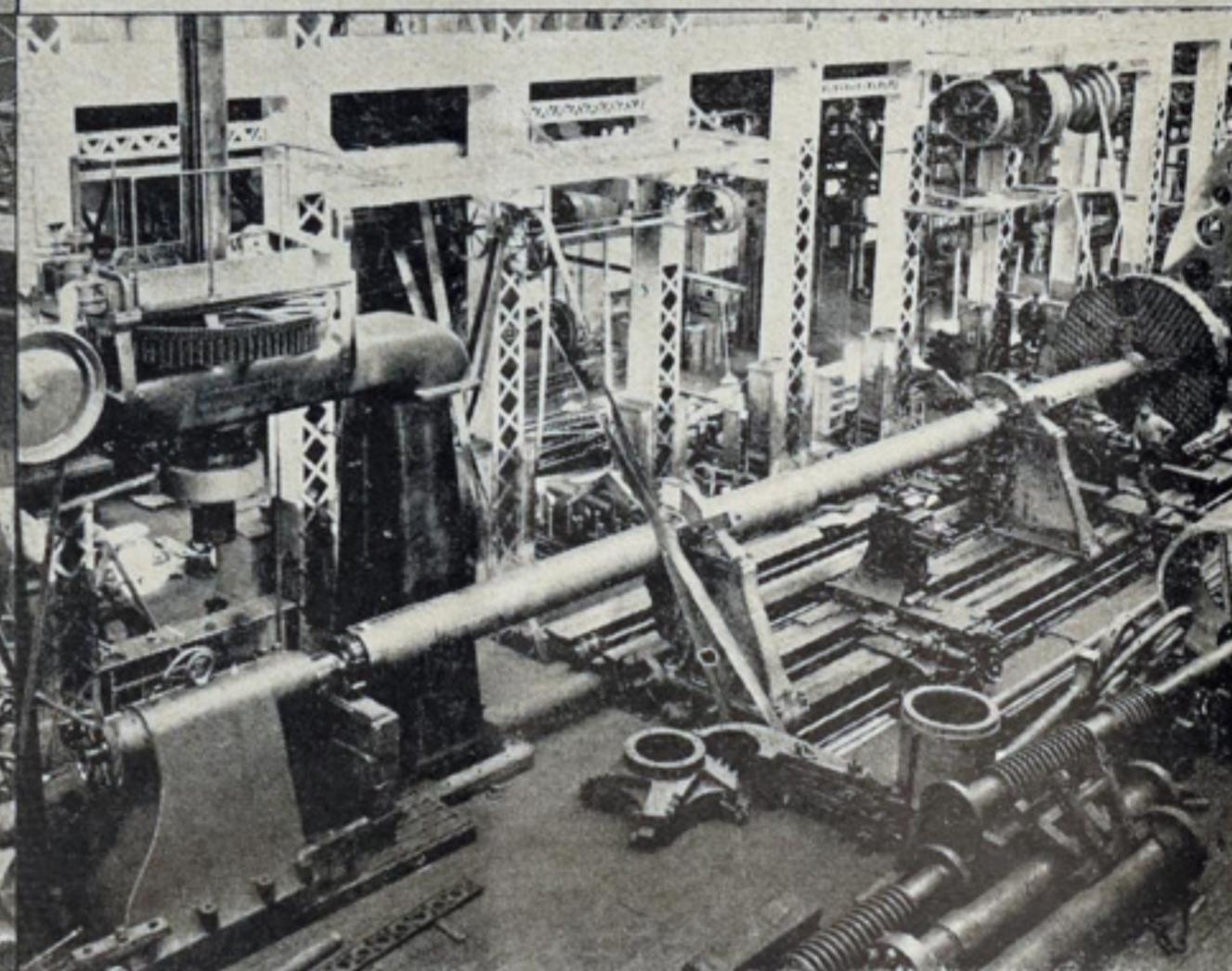
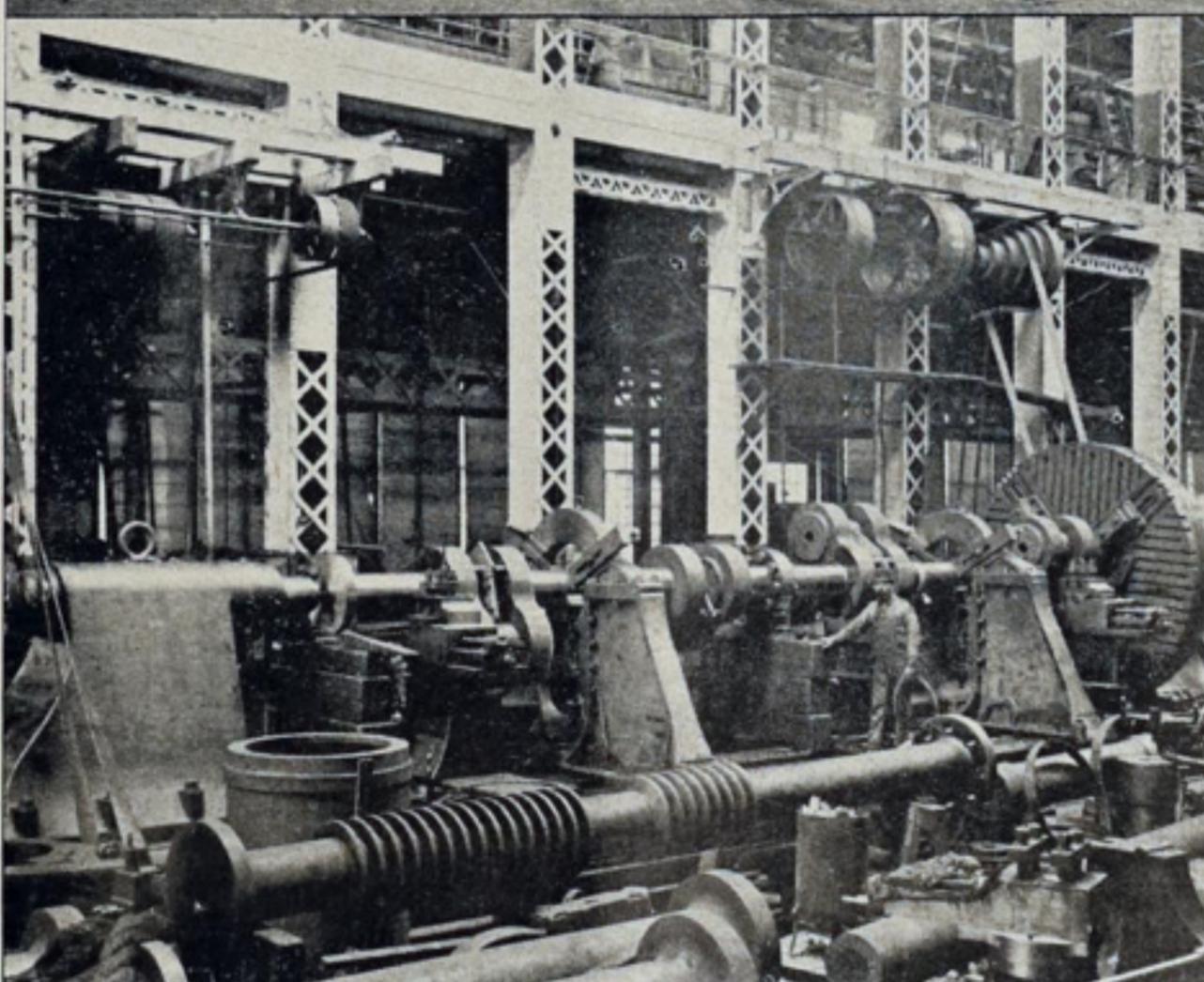
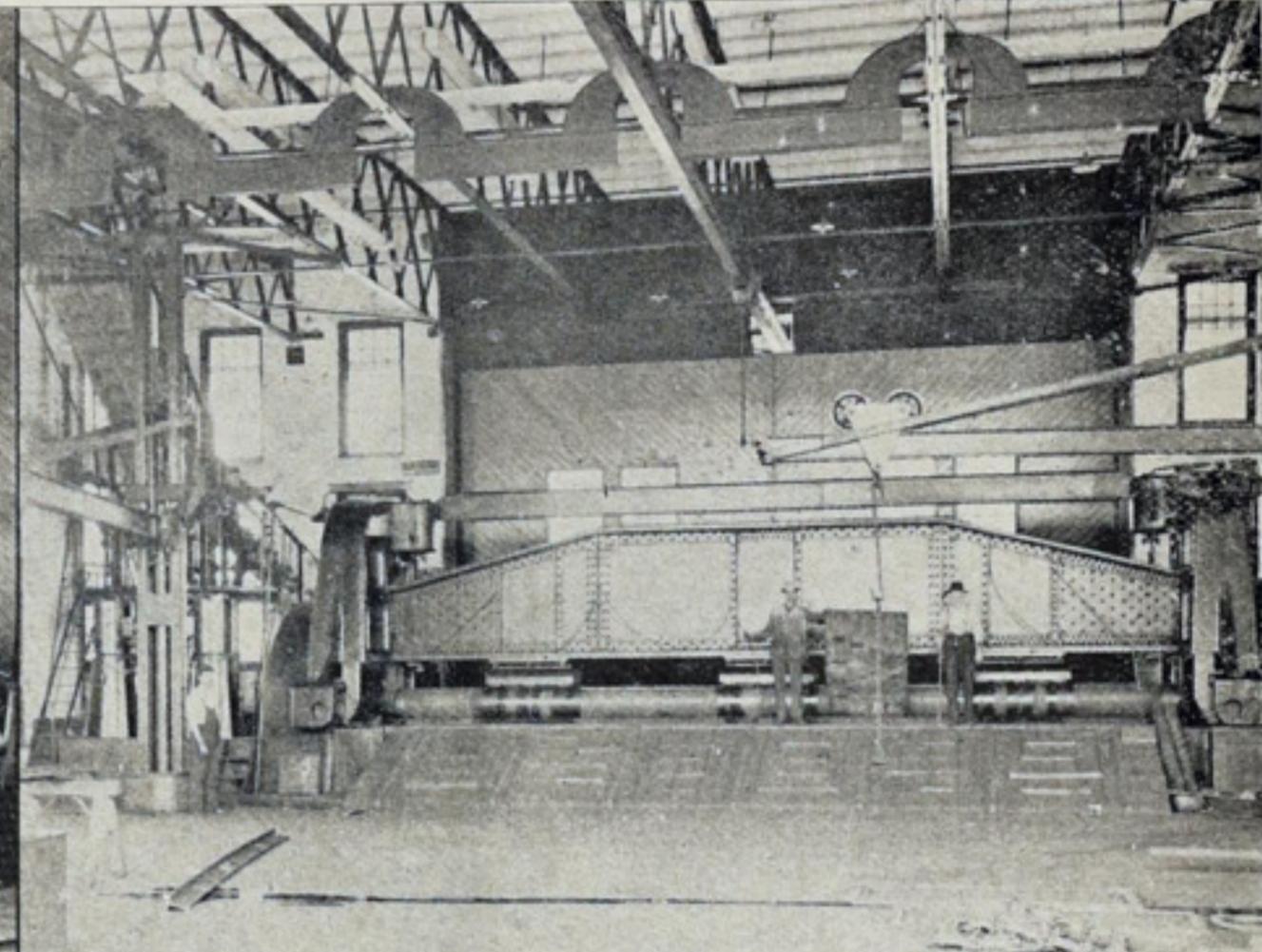
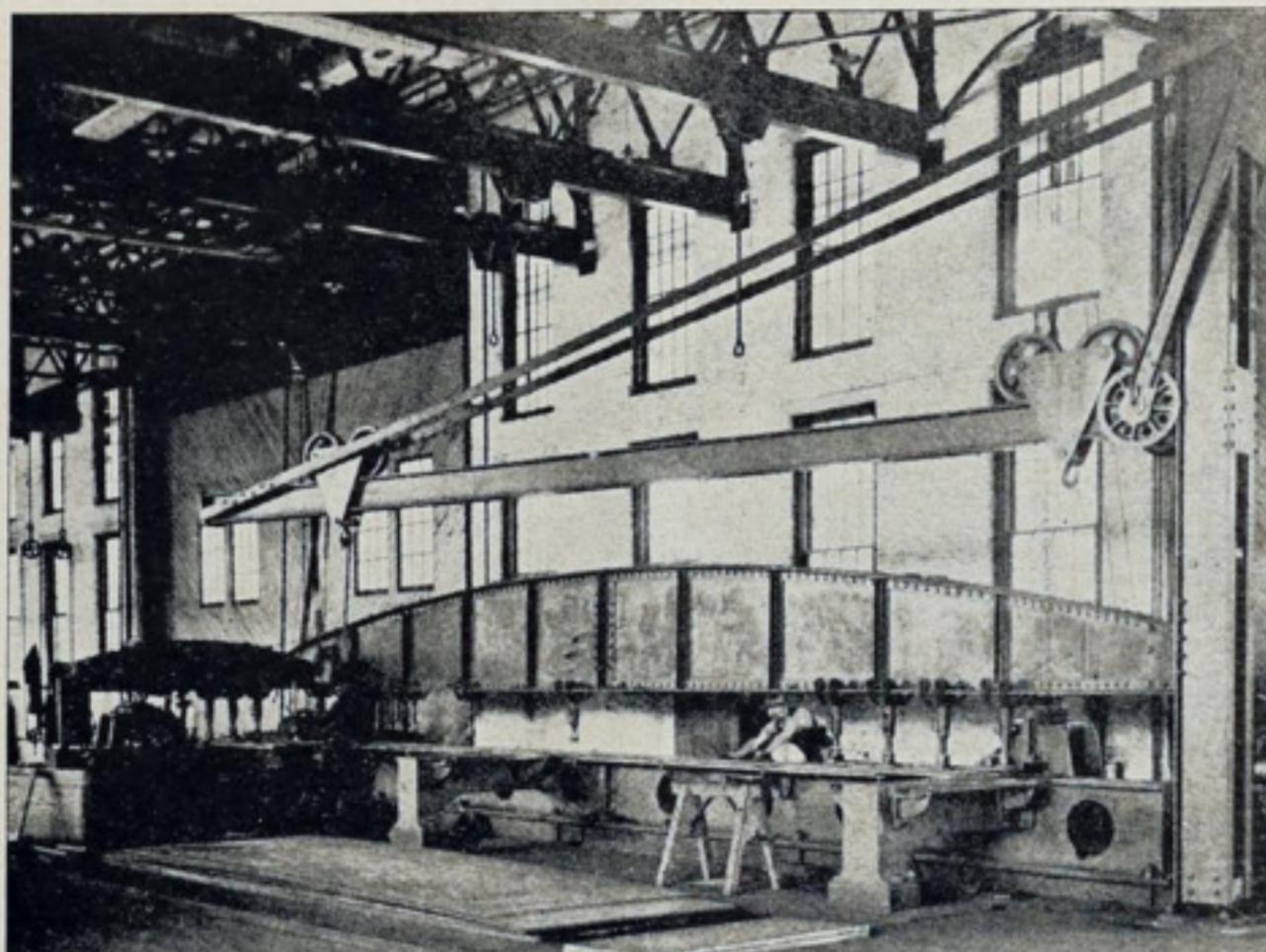
One of the most interesting machines in this shop is a hydraulic man-hole punching machine, which was made by the Newport News company and is probably the largest of the type in the United States. With 1,500 pounds pressure it punches a manhole 18 by 27 inches in size and $\frac{3}{4}$ inch

in thickness. From designs furnished by officials of the yard, Bement, Miles & Co. also manufactured and installed a Z bar cutter, which is capable of handling Z angles $6 \times 6 \times 3\frac{1}{2}$ inches in size. The William Sellers & Co. plate shears is 3 feet in the throat and handles plate ranging from $\frac{1}{4}$ to 1 inch in thickness. There are three hydraulic crane presses of a working pressure of 750 pounds to the square inch, which are used for setting frames and straightening angles. Four 5-ton gib cranes are operated by hydraulic power and there are also seven chain purchase gibs of a capacity of 3 tons each. About fifty men are employed in this department. For the assembling of frames there are provided twenty-four trolleys with a 2-ton chain purchase attached to each.

Adjoining the framing shed is a two-story frame building measuring about 40 by 50 feet, which is used as a grinding room and as a general store room for the riveters and fitters. In the grinding room are eight emery wheels ranging in size from 9 to 36 inches; four grinding stones, each 4 feet; three bolt cutters and one nut cutter. Power is furnished from a General Electric Co. motor of $11\frac{1}{4}$ horse power. The fitters and riveters department consists of six or seven rooms occupied by storage

Bement, Miles & Co.; four Long & Alstatter plate punching machines, with a capacity for plates ranging from $\frac{1}{4}$ to 1 inch; 6-foot plate straightening rolls of Bement, Miles & Co. manufacture; four radial drill presses for drilling holes $\frac{1}{4}$ to 2 inches in diameter; two portable drill presses supplied by Bement, Miles & Co. and designed to drill holes not over $1\frac{1}{4}$ inches; plate scarfing machine for plates up to 5 feet 10 inches, by the Pedrick & Ayer Co., Philadelphia, and a horizontal universal drill punch manufactured by the Deetrick & Harvey Machine Co. of Baltimore, which is capable of drilling holes 3 inches in diameter.

In this ship shed are the 32-foot bending rolls, which enjoy the distinction of being the largest in the world, and which were manufactured by Bement, Miles & Co. of Philadelphia from special designs furnished by the Newport News Co. These rolls are driven by a 50 horse power engine and are regulated by hydraulic power. They are used for flanging purposes only. Connected with the shed is a motor and grinder room in which is installed a 65 horse power motor and two grinding machines, 9 and 36 inches respectively, for twist drill work. There is also a small tool room for the preparation of punches and dies for the machinery.



32-FOOT PLATE PLANER—SHIP SHED.
CRANK SHAFT OF THE STEAMSHIP LA GRANDE DUCHESSE IN 125-INCH LATHE.

bins for bolts and rivets of various sizes. The four keepers are assisted by four men who are engaged constantly in bolt cutting, four in grinding and four in sorting bolts.

The ship shed, a commodious brick building, 60 by 320 feet in size, in which are employed about 90 men, has a most admirable equipment of machinery. At one end is a Long & Alstatter guillotine shear, which cuts through a maximum thickness of $\frac{7}{8}$ inch and takes material up to 4 feet 6 inches at one cut. There is an automatic shear blade grinder, which will grind a plate up to 5 feet in length, and a cold saw which is capable of sawing beams 6 inches in thickness and 12 inches in width. This machine is the product of the Newton Tool Co. of Philadelphia. There is a Bement, Miles & Co. square and round punch, with a diameter of 3 inches, designed for a $\frac{3}{4}$ -inch plate. A William Sellers & Co. plate shears is 39 inches in the throat and handles plates ranging from $\frac{1}{4}$ to $1\frac{3}{8}$ inches in thickness. Other machines are a 28-foot plate planer; William Sellers plate puncher, 39 inches in the throat; Bement, Miles & Co. shears, 36 inches in throat, and a punch of the same manufacture 30 inches in throat. The three latter machines take plate ranging from $\frac{1}{4}$ to $1\frac{1}{4}$ inches in thickness. Other machines in the equipment are as follows: Three radial counter-sinking machines for counter-sinking plate, $\frac{1}{4}$ to $1\frac{1}{2}$ inches; an 18-foot Bement, Miles & Co. planer; 32-foot Hilles & Jones planer; a set of 16-foot plate bending rolls, manufactured by

34-FOOT HYDRAULIC BENDING ROLLS—SHIP SHED.
SHAFT OF THE STEAMSHIP ST. PAUL IN THE 125-INCH LATHE—MACHINE SHOP.

The equipment includes four small drill presses, ranging from $\frac{1}{8}$ to 1 inch, manufactured by Edward Harrington & Son, Philadelphia; one 20-inch lathe; a 16-inch lathe, and a shaper of 14 inches stroke.

Beam and angle shops are under the direction of Mr. C. White. The angle shop, which furnishes employment to eighty men, is about 90 by 230 feet and is equipped with nine small heating furnaces and twenty-seven welding fires or blacksmith forges. Here there are eight traveling cranes of 3 tons capacity. The beam shop is 80 by 300 feet and gives employment to twenty-four men. The equipment includes six 2-ton gibs; a hydraulic beam press, manufactured by Bement, Miles & Co. and capable of setting a cold bar 10 by 3 inches in size; and a Long & Alstatter horizontal beam punch capable of punching a hole from $\frac{1}{4}$ to $1\frac{1}{8}$ inches in diameter through plate $\frac{3}{4}$ inch in thickness. There is a 35 horse power blast, with Buffalo Forge Co.'s fans, capable of blowing 60 forges. An overhead trolley system with adjustable hand power is capable of handling beams up to 2 tons, this system running the full length of the shop. There are also eight forges for welding beams and four furnaces for splitting beams. A feature of the system employed at the Newport News yard which may be mentioned in this connection is that all material in storage is racked to prevent rust.

The blacksmith shop is equipped on the same scale of completeness that is characteristic of other departments. This shop, a brick structure

300 feet in length by 100 feet in width, is under the foremanship of Mr. James Wilkie, whose force numbers 175 men. The steam hammer equipment, which was supplied for the most part by Bement, Miles & Co. of Philadelphia, consists of three 600-pound hammers, three 800-pound, two 1,100 pound, one 2,500-pound, and one 3,000-pound hammer. There is a pair of the heaviest cutting shears ever made. They were furnished by Long & Alstatter. The maximum dimension of cut is 4 inches square. There is one large and two small forge furnaces; one 15-ton and two 5-ton hydraulic cranes, three gib cranes and fifty forge fires. The anvils used are of the Peter Wright make and range from 250 to 400 pounds. There are also two 3,000-pound anvils, which were cast at Newport News.

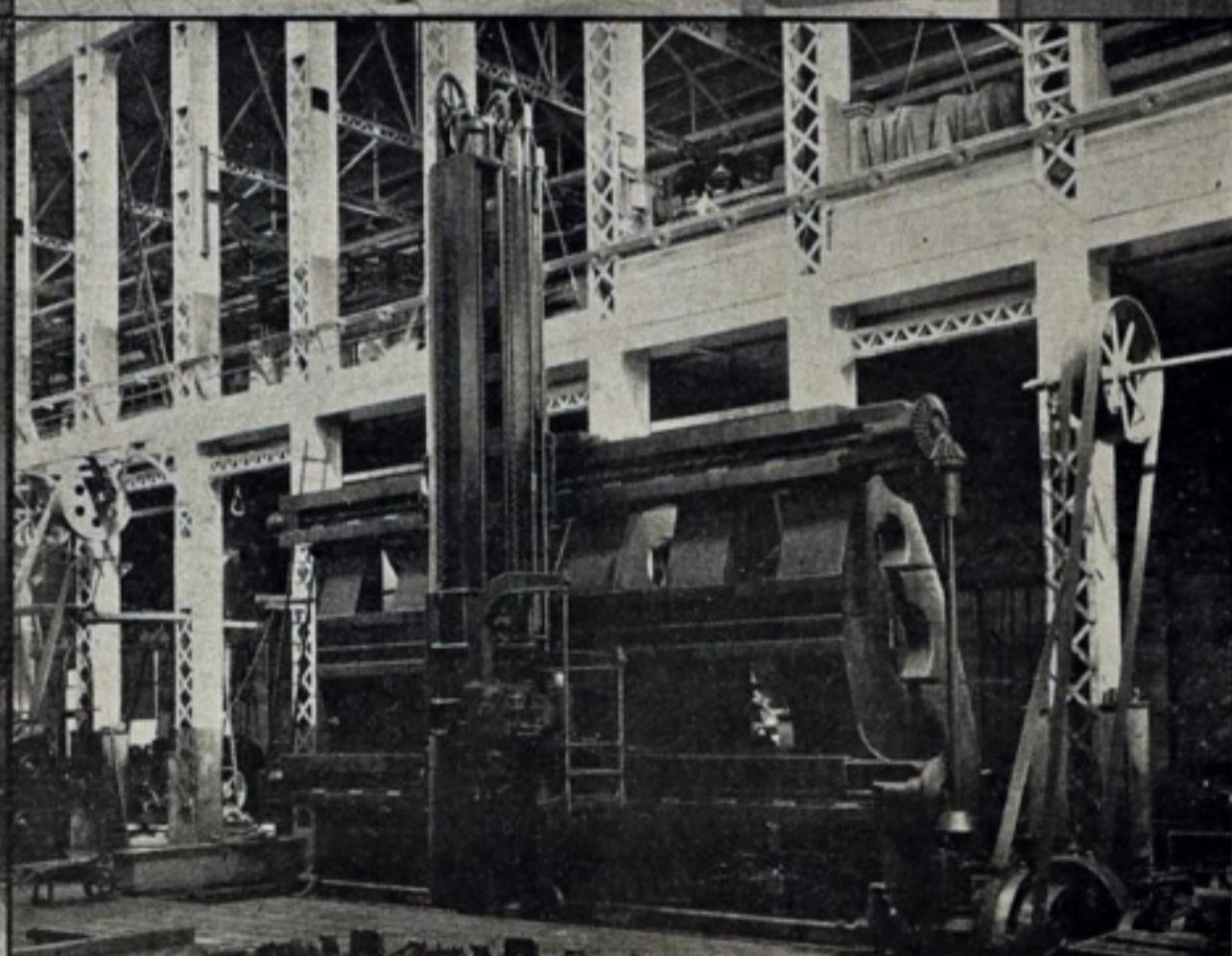
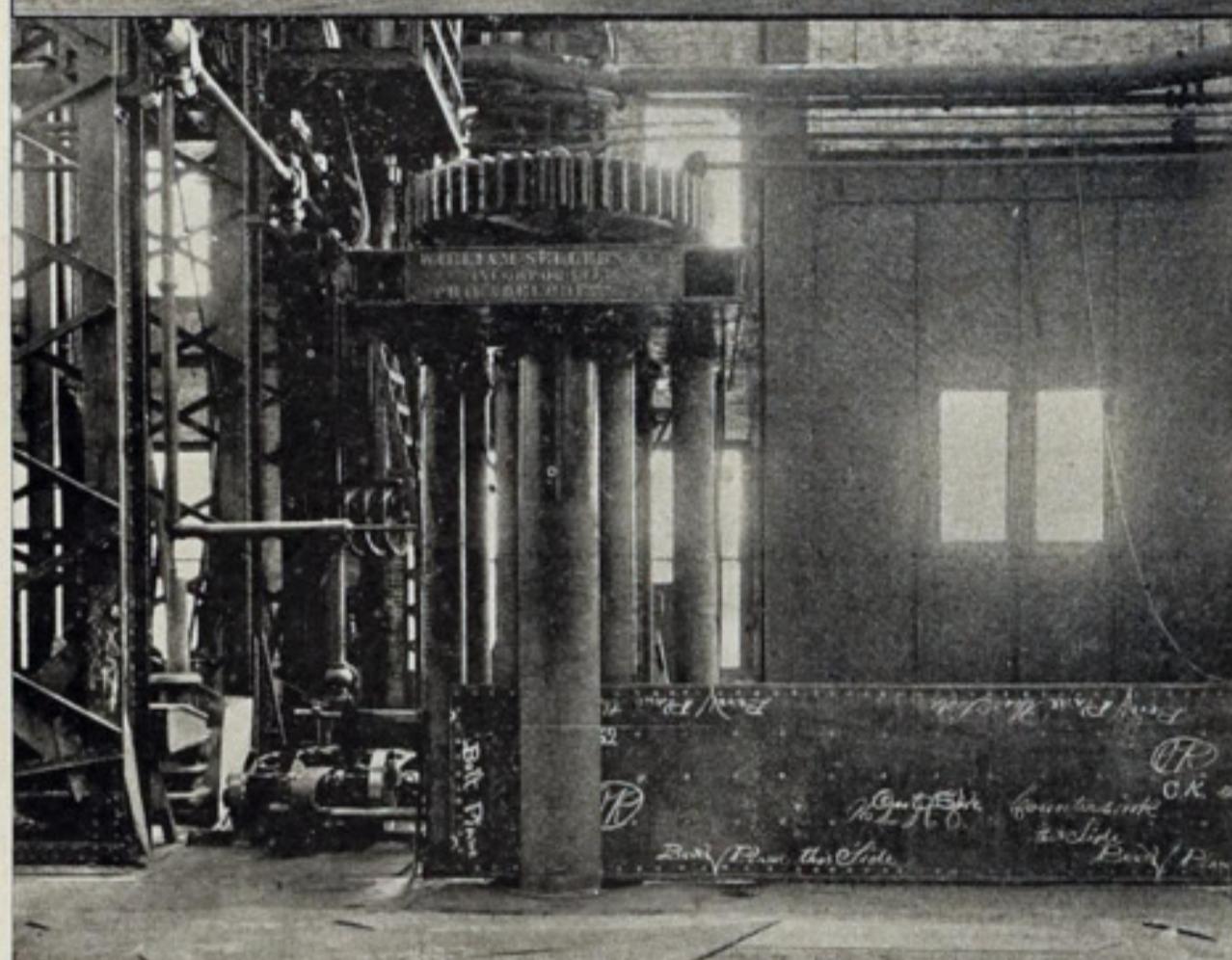
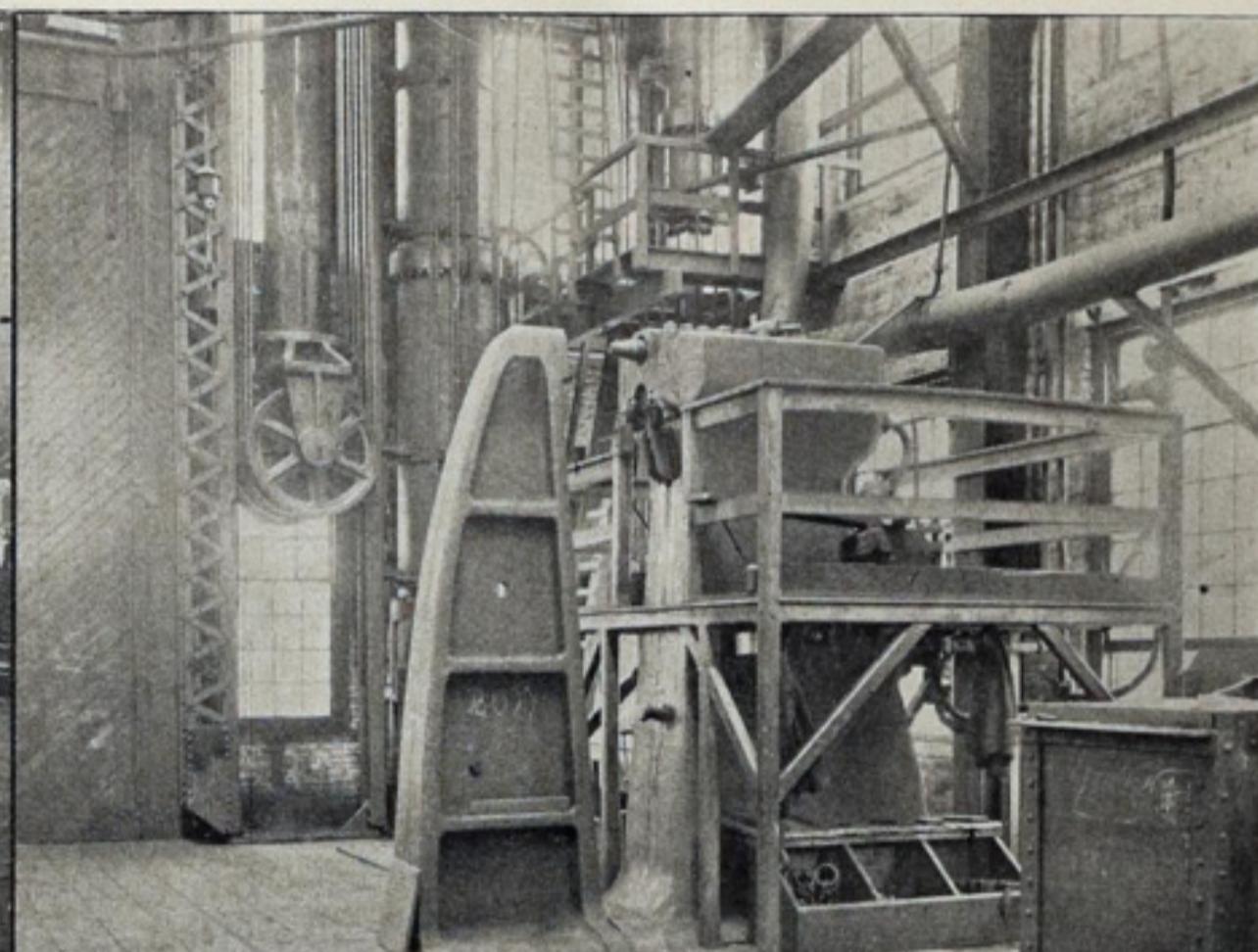
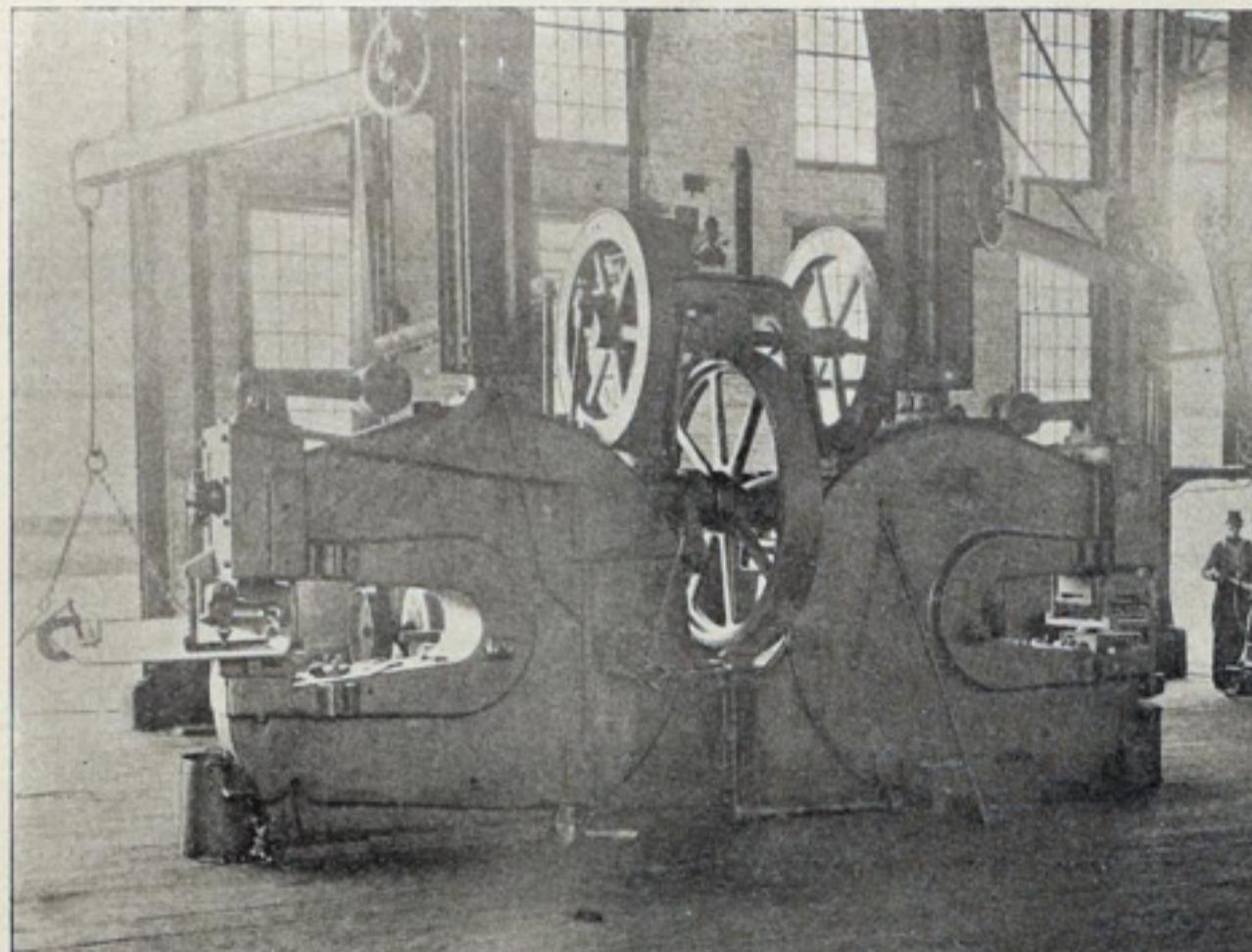
POWER HOUSE, STEAM PLANT, ETC.

The main power house, in charge of Chief Engineer W. G. Hopkins, is a two-story brick structure, from which not only is power supplied direct to many of the buildings throughout the yard but steam is supplied for almost all of the small independent engines installed in the various departments for the operation of special machinery. On the top floor is

pounds working pressure, and manufactured by the Lake Erie Boiler Works, Buffalo, N. Y. The Scotch boilers each have a grate surface of 41 square feet and the vertical boilers of 28 feet, making a total grate surface of 220 square feet. The average consumption of coal is 30 pounds per square foot of grate surface. At power plant No. 2 is one Scotch boiler 12 by 10 feet in size, and of 90 pounds working pressure, which is used for supplying the 150 horse power auxiliary engine in the ship shed.

From the main power house extends the subway whereby the steam is conveyed to the various small engines heretofore mentioned and which are located in the various shops throughout the yard. This subway, which has an aggregate length of more than 600 feet, is of iron and 8 feet in diameter, and not only conveys all the steam, hydraulic and electrical appliances, but allows room for a walkway.

The boilers are run by induced draft on the Sturtevant system, the equipment consisting of two fans, each 8 feet in diameter, and two double 8-inch engines. The original idea was that a stack of 125 feet would have to be erected at the power house, but so successful was the Sturtevant system that it was decided to erect only a 60-foot stack, and indeed this is



48-INCH CAP DOUBLE PUNCH—SHIP SHED.
10-FOOT VERTICAL BENDING ROLLS—BOILER SHOP.

the blowing plant, consisting of two 65-horse-power Sturtevant fans, driven by a 150 horse power Westinghouse engine, which supply the blacksmith shop and ship shed.

There are two annealing machines of 30 horse power each for annealing armor plate and one 60-horse-power annealing machine. There are also two 150 horse power General Electric generators, driven by a 250-horse-power Westinghouse engine for supplying power to the 140-ton crane, one cantilever crane and the two 60-ton electric cranes in the machine shop. Six Loomis electric generators of 50 horse-power each, driven by two Westinghouse 125-horse-power engines, connected in series, supply current for lights on the battleships under construction, the lamps in question numbering in the neighborhood of one hundred. Two Ingersoll-Sargent air compressors of 350 horse-power each (air compression 100 pounds) drive the air drills, hammers and riveting machines. Power for the regular lighting plant of the yard is supplied by an Ideal 90-horse-power engine and a General Electric Co. compound dynamo. The plant consists of about 2,500 16-candle-power incandescent lights and fifty arc lights. A two-system Worthington hydraulic pump, working at 750 and 1,500 pounds respectively, furnishes power for bending keels, for flanging and riveting boilers, etc. The fire pump has a capacity of from 400,000 to 500,000 gallons per day.

The steam plant consists of four Scotch boilers, each 11 feet in diameter by 13 feet long, and two vertical boilers, each 15 by 6 feet, all of 125

HYDRAULIC BULL, 10 FEET 6 INCHES GAP—BOILER SHOP.
22-FOOT BY 20-FOOT HORIZONTAL AND VERTICAL PLANING MACHINE—MACHINE SHOP.

needed only on Sundays or at other times when natural draft is used. The best grade of Chesapeake & Ohio coal is used exclusively at the power house. The coal cars are run onto a track which extends along the side of the power house and the coal is dumped through chutes from the bottom of the cars. The average consumption of coal is about 1,200 tons per month. The power house force consists of four engineers and eight firemen.

In the boiler shop, a four-story brick building, 300 feet in length by 100 feet in width, about 350 men are employed. The foreman is Mr. J. F. Gallagher, and his assistant, upon whom much of the work of supervision devolves, is Mr. F. R. Scofield. Here there is a 60-horse-power motor. The shop is fitted with a 15-ton hydraulic crane, and there are straightening rolls for 5-foot plate and also rolls for 11 foot plate. A combination punch and shear is 23 inches in the throat, and a horizontal punch, manufactured by William Sellers & Co., will punch holes up to 1½ inches in diameter in any thickness of plate up to 1 inch. The equipment includes also four blacksmith forges and 12-foot bending clamps; a William Sellers & Co. punch, 30 inches in the gap and capable of punching a 1-inch hole in 1½-inch plate; a William Sellers & Co. 24-foot planer and a 14-foot butt planer. One of the interesting machines in this department is a man-hole cutter manufactured by Bement, Miles & Co., and in which plate up to a thickness of 1½ inches may be handled with ease. The Morgan Engineering Works, Alliance, O., has supplied a flanging machine with

10-inch cylinders and with a capacity for $\frac{3}{4}$ -inch plate. Two other William Sellers & Co. machines are a shears, 23 inches in the gap, and upright rolls, 9 feet wide, which will roll $1\frac{5}{8}$ -inch plate. The Morgan Engineering Works has also supplied a hydraulic riveter, which works under a pressure of 1,500 pounds, and there is a 40-ton hydraulic traveling crane made by R. D. Wood & Co. of Camden, N. J.; also an 80-ton electric traveling crane. The machinery installation here includes further a drill press with four drills, manufactured by Thomas H. Dallett & Co., Philadelphia; a Bement, Miles & Co. upright press with 21-foot table; four radial presses, also manufactured by Bement, Miles & Co., and having a capacity for holes up to $3\frac{1}{2}$ and 4 inches, and six portable drill presses for 17-16-inch holes.

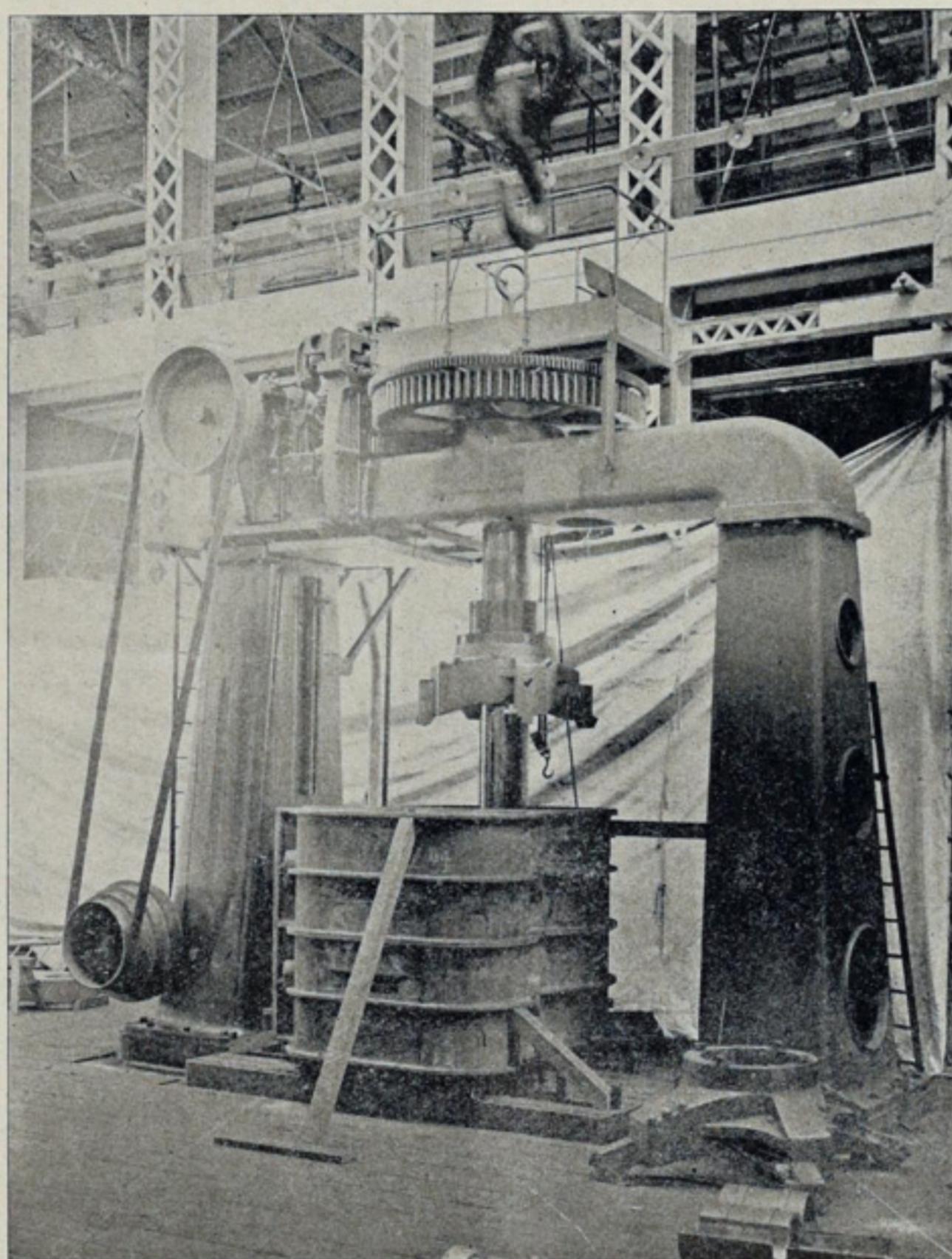
Connected with the boiler shop is the sheet iron department. The equipment here includes a circular shears manufactured by the Niagara Stamping & Tool Works; large shears, 48 inches in the clear, and which will cut up to No. 12 wire gauge; an 8-foot sheet iron brake, manufactured by J. M. Robinson & Co. of Cincinnati; a drill press, manufactured by Harrington & Co. of Philadelphia, and a full equipment of tinsmith's tools. This department force is in the neighborhood of eighty-five men.

WOOD WORKING DEPARTMENT—STOCKS OF FINE LUMBER.

The joiner shop is a very commodious, three-story brick building of about 300 feet length by 60 feet width. The first and second floors are devoted to the joiner shop proper, while the third floor is occupied by the

mill, with a saw 46 feet in length, with air feed for carriage and a capacity of 35,000 feet per day. The main lumber shed is a two-story frame structure, 300 feet in length by 36 feet in width with a capacity of 1,500,000 feet of lumber. The secondary shed is a single story structure but with high pitch and 200 feet length by 50 feet width. The capacity of this latter shed is in the neighborhood of 500,000 feet of lumber. The stock of lumber in the yard at the close of 1898 aggregated 3,248,000 feet, but within a few weeks after that time the arrival of material for the large dry dock and for other purposes had brought the total up to between 4,000,000 and 5,000,000 feet. This lumber, ranging in value from \$10 to \$500 per one thousand feet, includes white pine, Virginia pine, mahogany, white holly, walnut, locust, sycamore, white bass, ash, cherry, quartered oak, rosewood, maple, teak, Susquehanna oak, live oak, Oregon pine, spruce, redwood, poplar, cypress, beech, elm, gum, cedar, white cedar, red cedar, hickory, yellow pine, white walnut, Chilian oak and persimmon. The lumber yard covers a space of about 500 by 900 feet, in addition to a 900-foot wharf, which is, during the greater part of the time, filled with lumber. There is a 7-ton locomotive crane built by the Brown Hoisting & Conveying Machine Co. of Cleveland for the handling of lumber in the yard. There are employed in the saw mill and lumber yard about forty-eight men. A feature of the yard is the spar pond, which is 75 by 200 feet, and where spars are kept in fresh water to keep them from cracking.

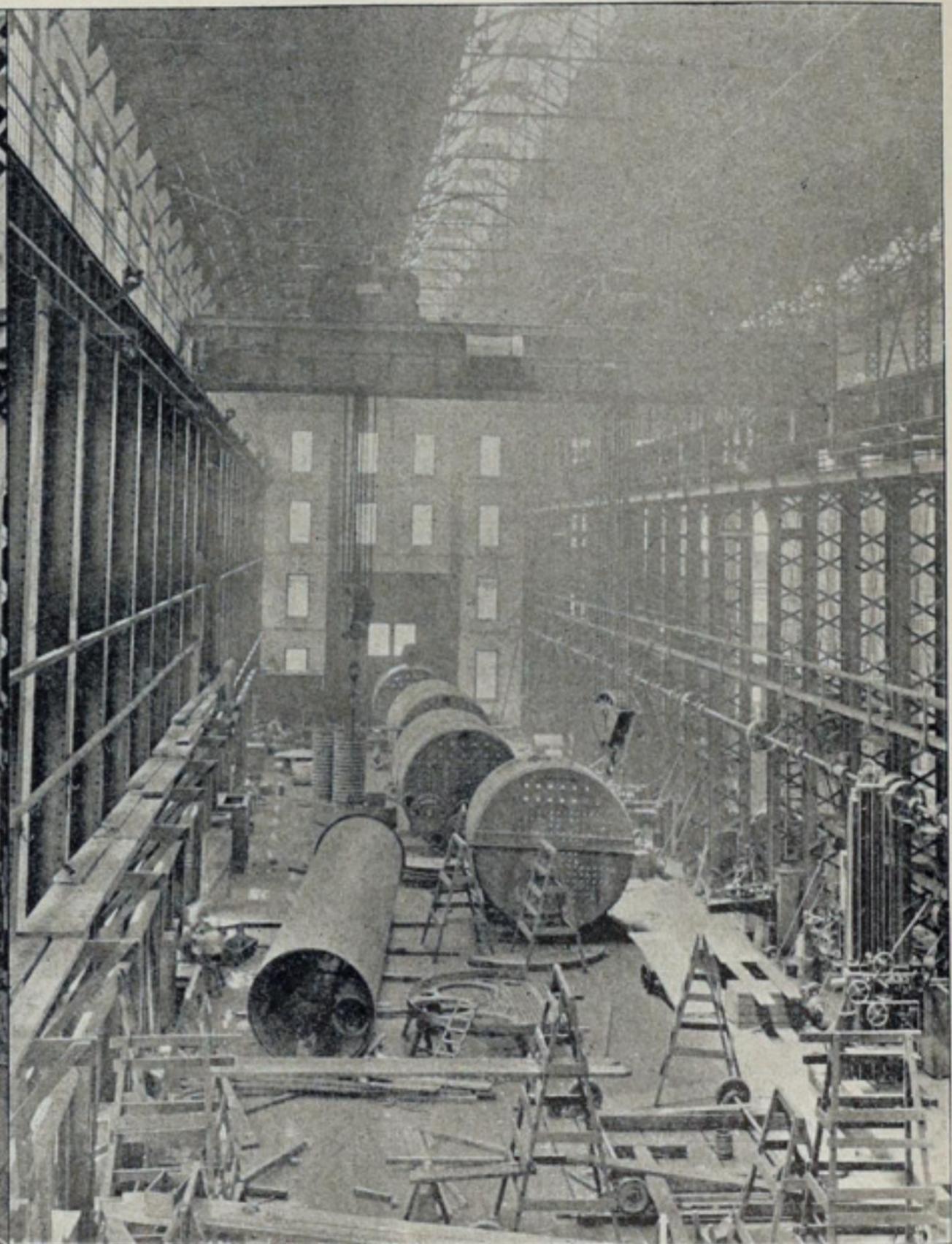
Included in the lumber department is the fire-proofing plant. This comprises a two-story building, 70 by 25 feet. There are five kilns, varying from 2 to 10 feet, making an aggregate of 100 by 75 feet, as well as



12-FOOT BORING MACHINE—MACHINE SHOP.

pattern makers, who are under the foremanship of A. W. Gildner. The force of men varies from 200 to 400, according to the amount of work in the joiner shop and on the vessels under construction, but about 50 men are regularly employed in the pattern shop. Power for the joiner shop is furnished by a Corliss engine of 250 horse power. The joiner shop equipment is of the very best. Planers of all dimensions, from machines capable of planing on four sides material 30 inches wide and 10 inches thick down through all the grades of single and double surface planers of good capacity, have been furnished by Goodell & Waters of Philadelphia, J. A. Fay & Co. of Cincinnati, H. B. Smith & Co. of Smithville, N. Y., and other well known manufacturers of high grade machinery. There is, of course, a full complement of the lighter machinery from 10 and 12-inch molders for four-sided work down to those with capacity for 6-inch stuff, as well as dove-tailing and blind cutting machines, and shapers or variety workers. A considerable portion of this machinery was supplied by Rowley & Hermance, Williamsport, Pa.

The lumber department of the Newport News yard, embracing, of course, the saw mill and several storage sheds, is probably the most complete at any American ship yard, if not indeed in the world. The advantageous features of the plan on which it is conducted are all the more noticeable by reason of the fact that this department is one which receives comparatively little attention in some ship building establishments. This department is under the direction of Mr. R. L. Davis. The saw mill is 150 feet in length by 40 feet in width, with a wing 45 by 20 feet, which is used as an engine and filing room and in which there is a 75-horse-power Atlas engine. In the main building is an Edward P. Allis No. 2½



SOUTH WING BOILER SHOP—BOILERS FOR STEAMSHIP LOUISIANA.

a smaller dry kiln of 25 by 16 feet. The plant is equipped with a 10-horse power engine and a Sturtevant fan 8 feet in diameter. By the utilization of a special subway of cement and brick of 4 feet diameter, hot air is forced through ports, which may be shut off, and passing through the lumber returns to the subway and is reheated. In addition to this installation there is a small pipe kiln heated from a radiator.

A FORTUNE INVESTED IN BIG TOOLS.

Very naturally, the pride of the Newport News plant is the machine shop—a magnificently equipped department in a most admirably arranged brick building, 500 feet in length by 100 feet in width, and with galleries extending throughout the entire length of the building on either side. The 350 men employed are under the direction of John Greensmith. A fortune has been spent for the tools and machinery with which this department is equipped. There are 84-inch, 60-inch, and 36-inch planers manufactured by William Sellers & Co. of Philadelphia. A wall planer installed by Bement, Miles & Co. of Philadelphia, is the largest in the world. The plane measures 22 feet and the slot 22 feet. This machine is a combined planer and slotter and is operated by a 50-horse-power General Electric motor.

The plant of vertical boring mills, supplied by the Niles Tool Works of Hamilton, O., includes one 10 by 16-foot mill, one 8-foot, one 6-foot and one 5-foot. There is a 125-inch shafting lathe, also furnished by Bement, Miles & Co., which will take 34 feet between the centers and has a swing of 125 inches diameter; a cylinder boring mill of 12-foot bore, manufactured by William Sellers & Co.; and two vertical boring mills

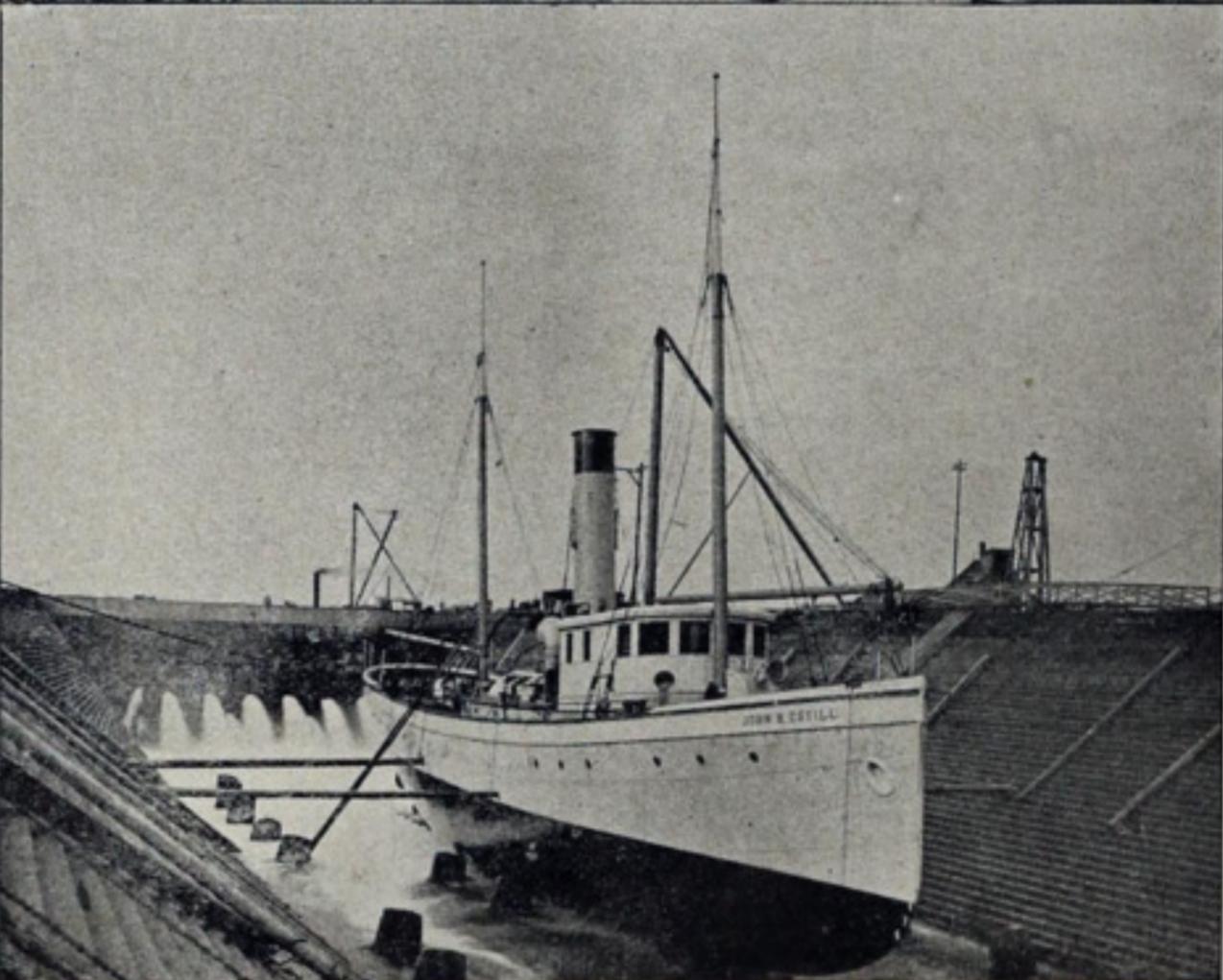
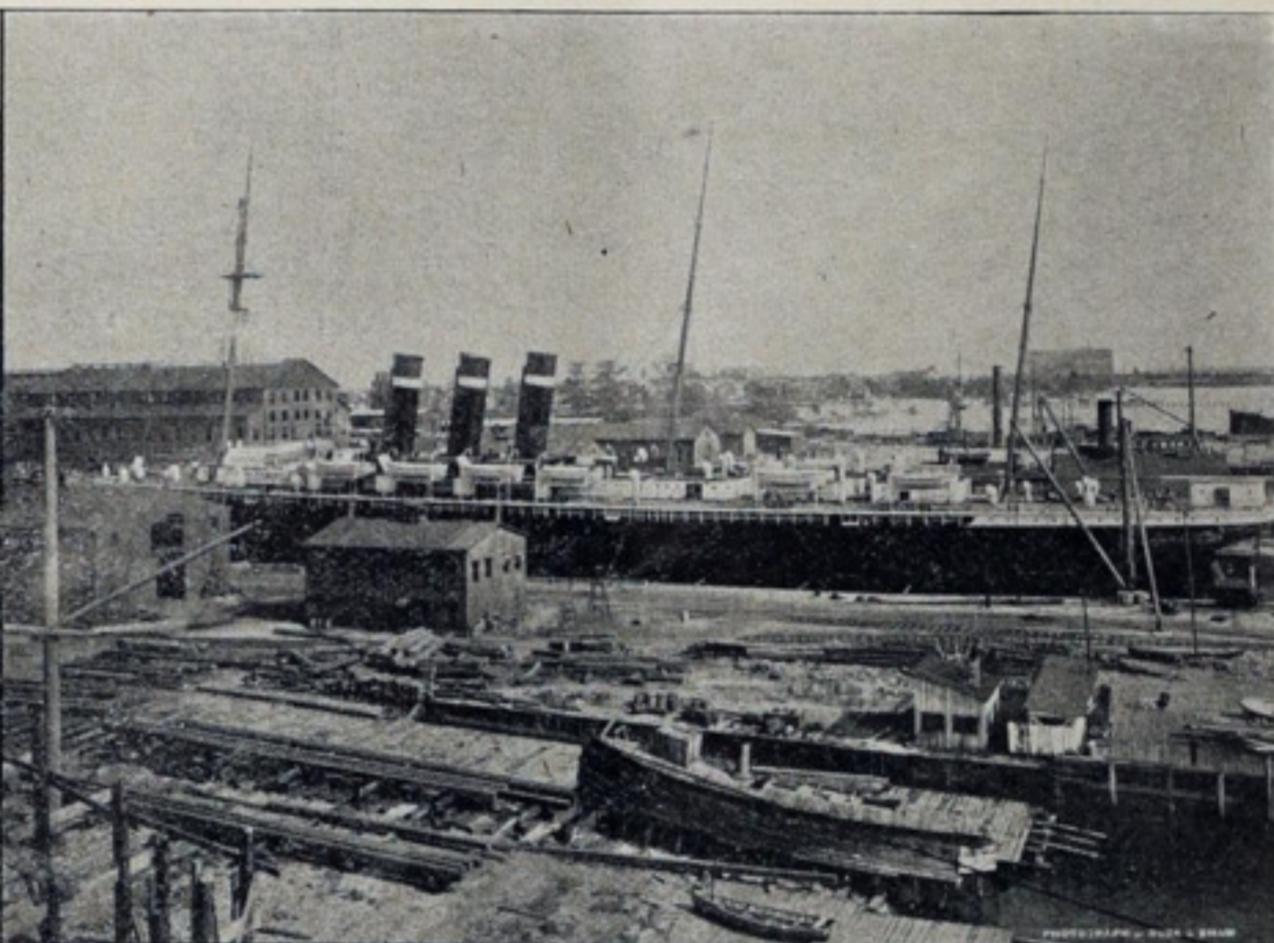
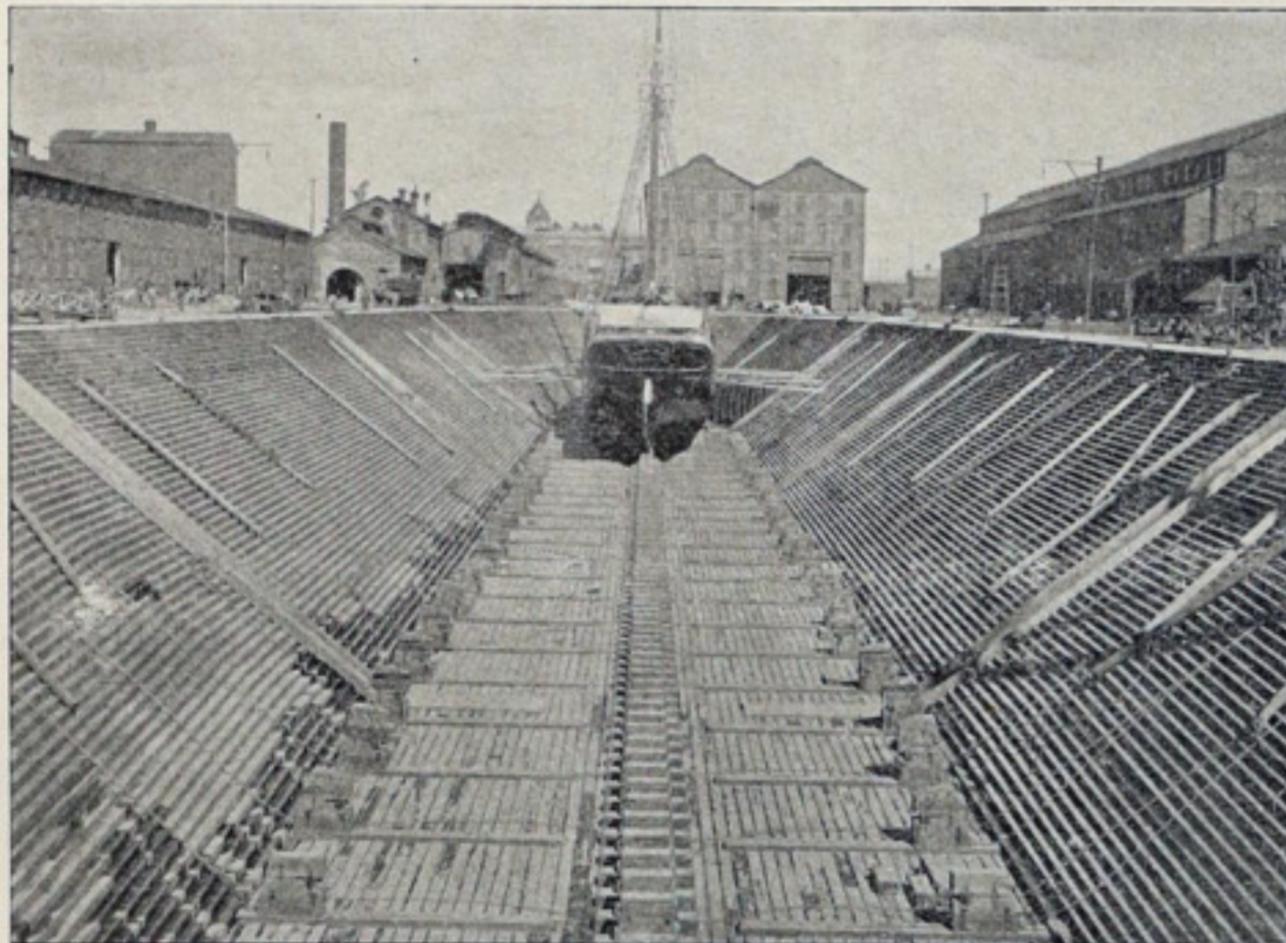
manufactured by Bullard & Co. Ten new Bullard lathes as follows: One 36-inch; two 32-inch; one 26-inch; one 52-inch, and four 20-inch. Also a 63-inch lathe of Bement, Miles & Co. make, which takes in a shaft 75 feet long, and a 36-inch lathe from the same firm, which has a capacity between centers of 26 feet. Then there are four 26-inch lathes manufactured by the Pond Machine Co. of Plainfield, N. J., with beds ranging from 12 to 28 feet; two horizontal drill presses of Bement, Miles & Co. manufacture, of 15-foot drill radius. Other machines supplied by the Philadelphia firm are: Two horizontal drill presses of 10-foot radius; four horizontal boring mills—two of 52-inch cylinders, one 30-inch and one 26-inch; four 16-inch shapers; three 12-inch slotters; one 16-inch slotter and one 24-inch slotter. In addition to these there were noted also one Richards open side planer, furnished by Pedrick & Ayer; four 24-inch turret lathes of the Bullard type; three small turret lathes; six brass lathes and six Bullard engine lathes, adapted for general brass turning.

The equipment of drill presses includes two of the Pond type; two new Pratt & Whitney presses; two 5-foot radial drills manufactured by Bement Miles & Co.; one circular drill for boring; six 32-inch drill presses, manufactured by Bement, Miles & Co. for general work, and four spindle drills manufactured by the same firm for tube sheets. There are

The copper department, in charge of F. Doherty, consists of a working shop of 50 by 125 feet, and a forge, 40 by 50 feet, adjoining the outfitting shop. A force of fifty-seven men is employed. The equipment includes a hydraulic bending machine, with a table of 6 by 5 feet, and a traveling crane with a capacity of 1,200 pounds, which runs the length of the shop. In the copper forge there are six 1,200-pound traveling cranes and seven forges of the ordinary type. The tinning pots are outside.

What is called the outside machine shop is in charge of G. W. Butler. The building is 50 by 200 feet, and from 80 to 100 men are regularly employed. The equipment includes an Acme bolt cutter, capable of cutting bolts up to $2\frac{1}{4}$ inches and manufactured by the Niles Tool Works, and nine lathes. Among the latter are two Bullard lathes with 16 to 20-inch frames, and six others manufactured by Saunderson Sons. There are pipe machines capable of cutting sizes of $\frac{1}{4}$ to 10 inches; two 12-inch shaping machines; one radial drill press of 4-foot swing and one centering machine. An equipment of two 30-inch drills, one 20-inch drill and four 18-inch sensitive drills, was furnished by Pratt & Whitney and Edward Harrington, Son & Co. of Philadelphia.

A feature of this department is the tool room where a most perfect check system is in operation. Every employee is given ten checks, each of the ten bearing, of course, the same figures. A workman must de-



DRY DOCK—LOOKING FROM GATE—POWER HOUSE, BOILER SHOP, MACHINE SHOP IN BACK GROUND. AMERICAN LINE STEAMSHIP NEW YORK IN DRY DOCK.
YACHT SENECA—TUG MONARCH, STEAMSHIP CLANDEBOYE IN DRY DOCK.

also four William Sellers & Co. 20-inch lathes of the tool-room type. The present machine shop is an enlargement from a former structure, and is divided into machine shop proper and erecting shop. There is a 40-ton electric traveling crane in the erecting shop and a 50-ton electric traveling crane in the machine shop; five 5-ton hydraulic cranes on piers and two 5-ton electric cranes in the wings. The galleries in the north and south sides of the machine shop are occupied by the brass department, while the gallery in the erecting shop is divided into store rooms.

The paint and oil department at the Newport News works is conducted in a very systematic manner and with special precautions as to fire. It is in charge of J. D. Hay, and occupies one building of fair size and several smaller ones. The main building is a two-story brick structure. There are separate oil houses, which are connected with the main building by pipes, thus making it possible to cut off the oil at the oil houses at night. Every possible precaution is taken, even to the extent of providing out houses in which all waste is stored and where the 130 workmen employed in the department place their working clothes when quitting in the evening. About 4,000 gallons of oil and from 15 to 25 tons of paint are kept constantly on hand.

posit a check every time a tool is taken from the tool room, and it is consequently a simple matter to keep track of the tools. No man who leaves the employ of the company is paid off until he has a certificate from the tool shop showing that no checks are held against him. Here may be found one 30-ton and one 20-ton pulling jack, operated by hydraulic power, and 28 hydraulic jacks of from 10 to 100 tons capacity which are used on the occasion of launches. There are 30 chain falls, differential pulleys of from 500 pounds to 6 tons capacity, and tools are of course kept here for the use of the entire outside work. At one end of this building is a testing plant where all copper pipes, valves, etc., designed for use on naval vessels are subjected to the tests prescribed by government specifications. Power for these tests is furnished by a 50-horse-power Westinghouse engine, to which steam is supplied from a Scotch boiler of 70 pounds working pressure.

GENERAL OFFICE BUILDING—MANAGEMENT OF EMPLOYEES.

The general office building is a three-story brick structure, 200 feet in length by 40 feet width. The first floor is devoted to offices and store rooms, the second floor to the offices of the executive staff and quarters for the government officials stationed at the yard, and the third floor to

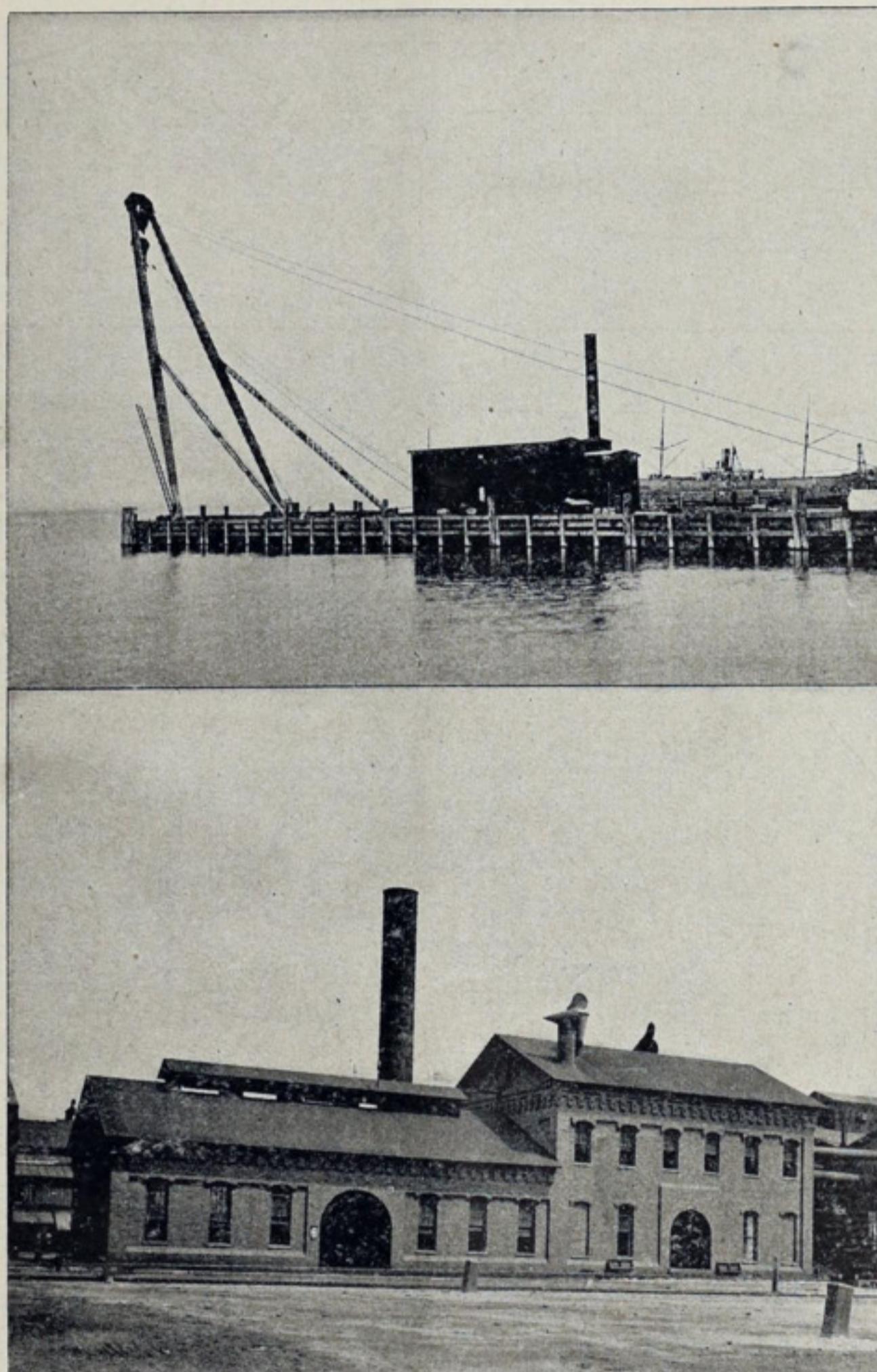
draughting rooms, the blue print studio being located in the cupola. The executive staff stationed at the works consists of Walter A. Post, superintendent; Fred. J. Gauntlett, secretary to the superintendent; James Rowbottom, superintendent machinery department; M. B. D. Doughty, superintendent hull department; John Livezey, local auditor; O. P. Loomis, electrical engineer; De Witt Crane, material agent. The draughting rooms are as complete as experience and a liberal expenditure of money can make them. C. F. Bailey is chief draughtsman of the engineer department, with C. F. Palen as assistant, and W. C. Foley is in charge of the department of naval architecture, with J. K. Davie as assistant. About thirty-five draughtsmen are regularly employed in the hull department and thirty-one are engaged on engine work. On the first floor is an immense check rack where the foremen from the various departments meet each day and compile reports showing the number of hours each man has worked.

The Newport News company has less trouble with its employes than almost any other large industrial institution in America. Few of its employes are members of labor unions and the firm never treats with any such organization with reference to anything. Each man is engaged individually and at wages commensurate with his ability. The discipline

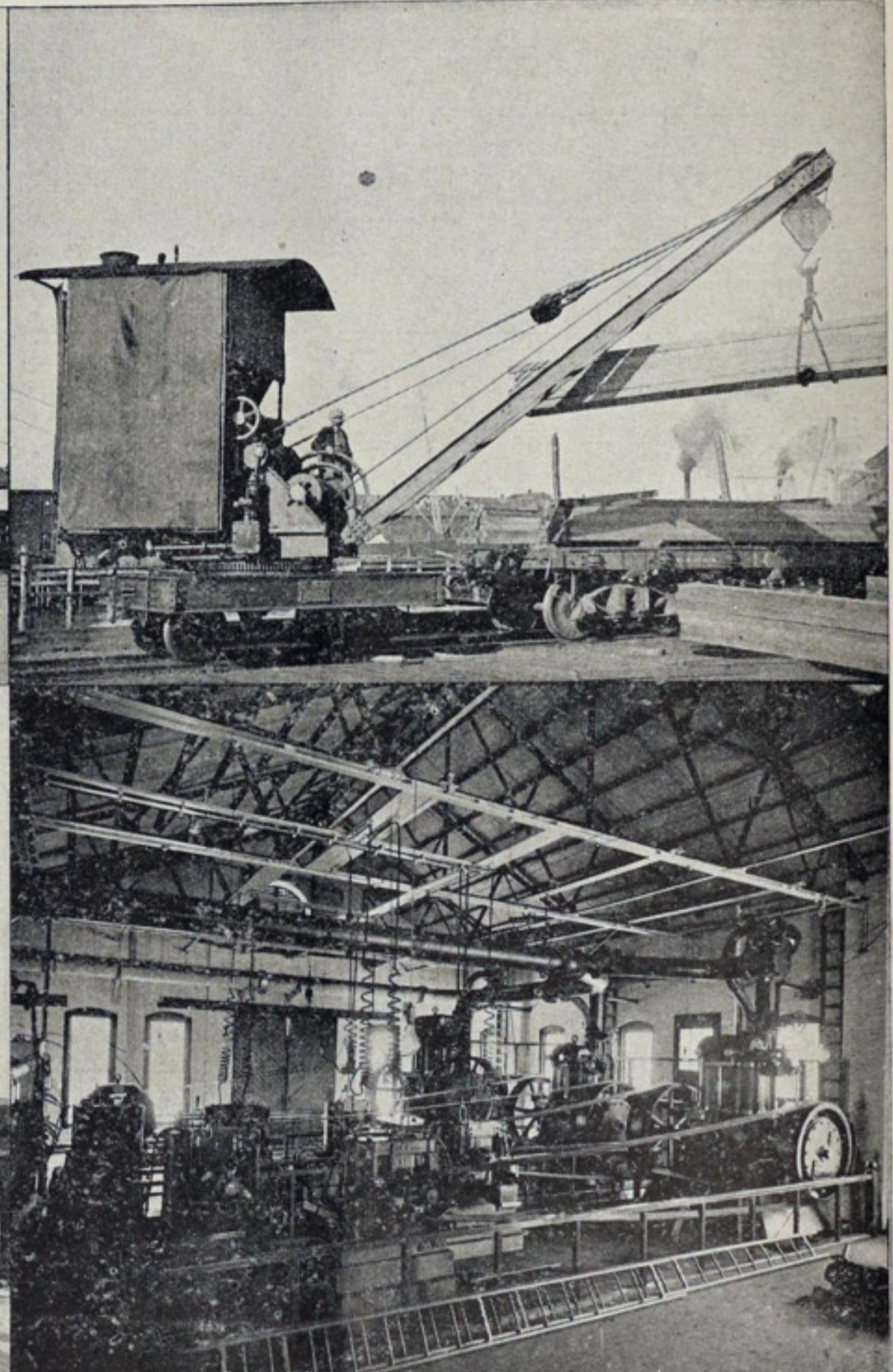
It will be seen by this reference to the large force employed on repairs at the Newport News plant that the repair work is a very important item. These works are already as well equipped for repairs as any ship building plant in the United States, and with the completion of the new dry dock now under construction the facilities in this regard will be fully the peer of that at any European yard. The old dry dock is of the following dimensions: Length on top, 610 feet; width on top, 130 feet; width at bottom, 50 feet; width at entrance, 93 feet; draught of water over sill, 25 feet. The time required to pump the water out of the dock is 1 hour and 30 minutes. One of the accompanying illustrations, which shows two vessels of ordinary size and a tug, gives a good idea of the dimensions of the dock. In it the vessels of the American line have been docked for repairs regularly for several years past.

NEW DRY DOCK—LARGEST IN THE WORLD.

The new dock—the largest in the world—was designed by General Superintendent W. A. Post and will involve an expenditure of more than \$1,000,000. Dimensions of the new dock are: Length on top 827 feet, length inside the caisson 806 feet, breadth on bottom 80 feet, breadth at top 162 feet. The entrance will be constructed so as to admit any vessel



100-TON SHEAR LEGS.
EXTERIOR OF MAIN POWER HOUSE.



5-TON LOCOMOTIVE CRANE FOR UNLOADING CARS.
INTERIOR OF MAIN POWER HOUSE.

and the equipment of the yard is most complete. There is a large force of watchmen, and admission to the yard is rigidly restricted during business hours. Fire mains extend everywhere, and a telephone system facilitates communication between the various departments. All departments of the works are operated ten hours daily and employes who desire may secure meals at a restaurant on the grounds. Material is supplied to workmen from the store houses on the presentation of orders signed by the foreman of the department wherein it is desired to utilize it.

The ship rigging and sail department occupies the second floor of a building 60 by 300 feet, the ground floor of which is devoted to the ship carpentry department. The sail and rigging loft, in charge of Charles Brown, is equipped with the usual tools and gives employment to from fifteen to twenty men. At one end of the building is the electrical department—wiring of ships, etc.—where several men are also employed.

The ship carpentry department is in charge of William T. Penn, who has from 400 to 800 men under his direction. The majority of these are engaged on outside work, mainly repairs. The extent and importance of this kind of work will readily be appreciated when it is stated that the Newport News company has had as high as thirty-five repair jobs on hand at one time. Galvanizing work, also cared for within this large establishment, is done in a small building near the main office building.

that can be accommodated inside the dock. The depth over the sill will be 30 feet at mean high water; mean range of the tide 2 feet 6 inches. The entrance abutments will be constructed of concrete lined with granite. The bottom of the dock will be of concrete over piling. The interior will be constructed of timber. The caisson will be constructed of steel and it will be operated with trimming tanks, so arranged that it will never be necessary to pump out the water ballast, as is done with all docks previously constructed in this country. The pumping plant has been designed to empty the dock in two hours, which is at the rate of about 200,000 gallons per minute. Two first-class battleships can be repaired in this dock at one time, or the largest ocean liner contemplated at this time will have plenty of room to spare in it. The dock will be equipped with Lawrence pumps, manufactured by the Prindle Pump Co. of Lawrence, Mass. The trolley used in the excavation for the new dock was furnished by the Lidgewood Manufacturing Co.

The preference manifested by the Newport News company for timber dry docks is the result of a very thorough investigation. The decision reached in this regard was induced in part by a knowledge of existing climatic conditions, but it was due in a great measure to the conviction of the officers of the company that not only would a stone dock cost

almost three times as much as a timber structure, but that the annual expenditure would not reach anything like the amount of interest involved in the heavy first cost of a stone dock. Provision will, of course, be made for a stone entrance—that portion of the dock which will be inaccessible to repairs.

The compressed air plant is also a feature of modern equipment. Power is furnished for practically all of the tools used on outside work. Originally the plant consisted of simply a small Rand compressor and a few tools. This was after a time supplemented by the addition of a couple of Pedrick & Ayer compressors and more tools. The two large Ingersoll-Sargent compressors now in use consist of one class G, duplex compound compressor with 20-inch steam cylinders, 20½-inch high pressure air cylinder, 32½-inch low pressure air cylinder and 24-inch common stroke, the engine having a receiver inter-cooler 36 inches in diameter by 9 feet 6 inches long, and having a discharge of 2,200 cubic feet of free air per minute at 100 pounds pressure; one class G duplex compressor, with 20-inch diameter steam and 20½-inch diameter air cylinders and 24-inch common stroke, the capacity being 1,600 cubic feet of free air per minute at 100 pounds pressure. Each compressor is fitted with piston inlet air cylinders, is water-jacketed and furnished with a governor automatic pressure regulator. The discharge of compressed air is made into a common storage tank at about 90 degrees pressure.

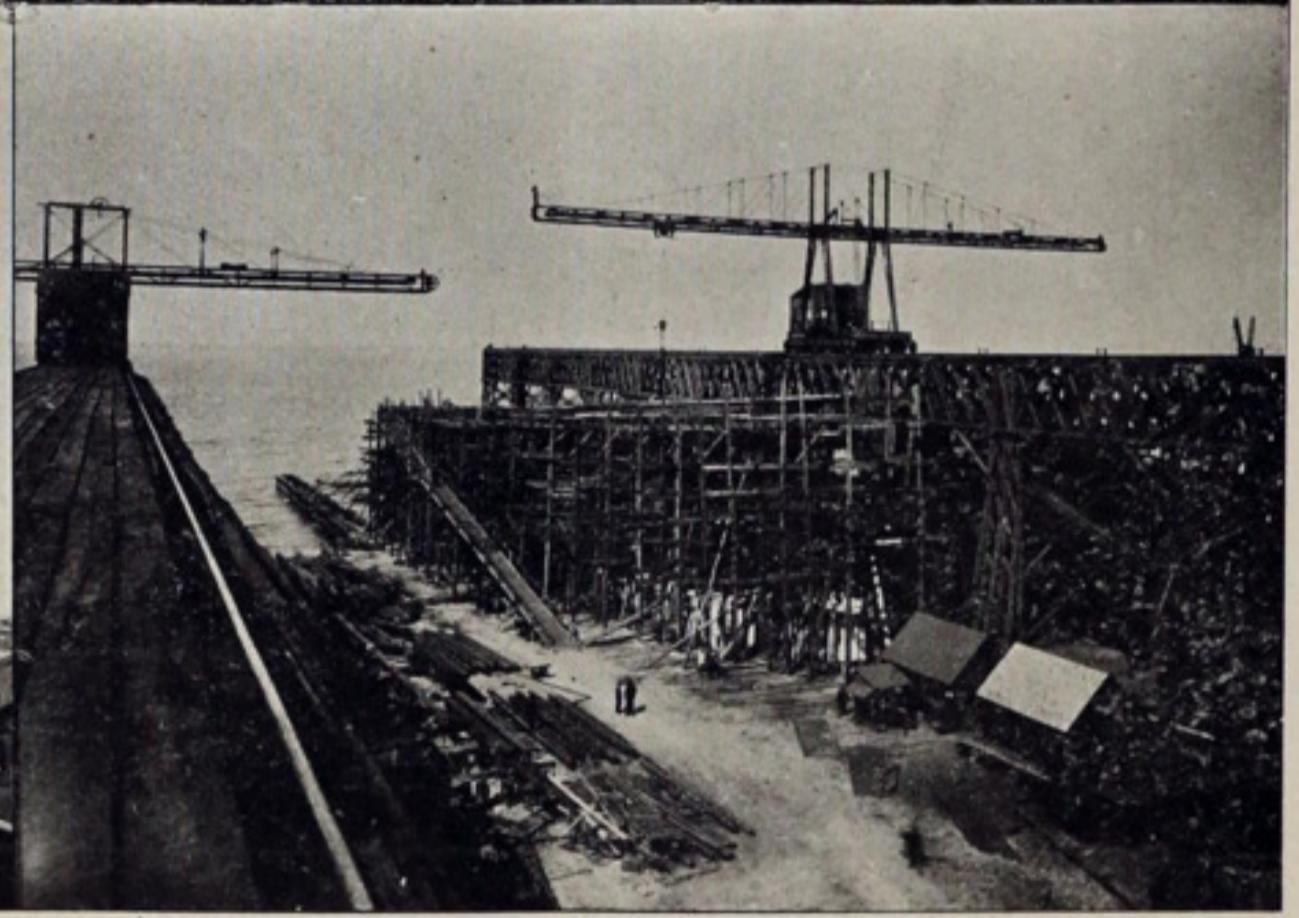
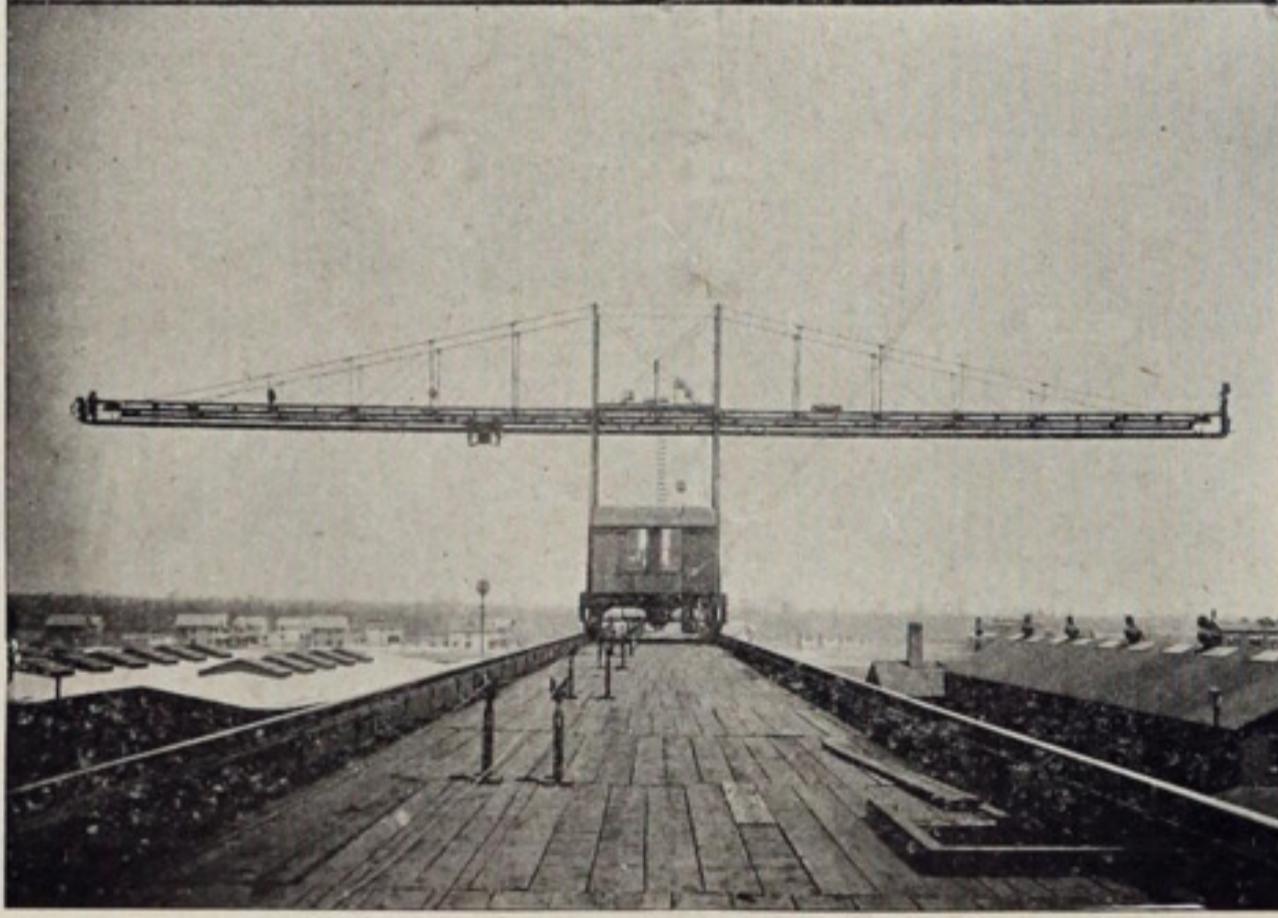
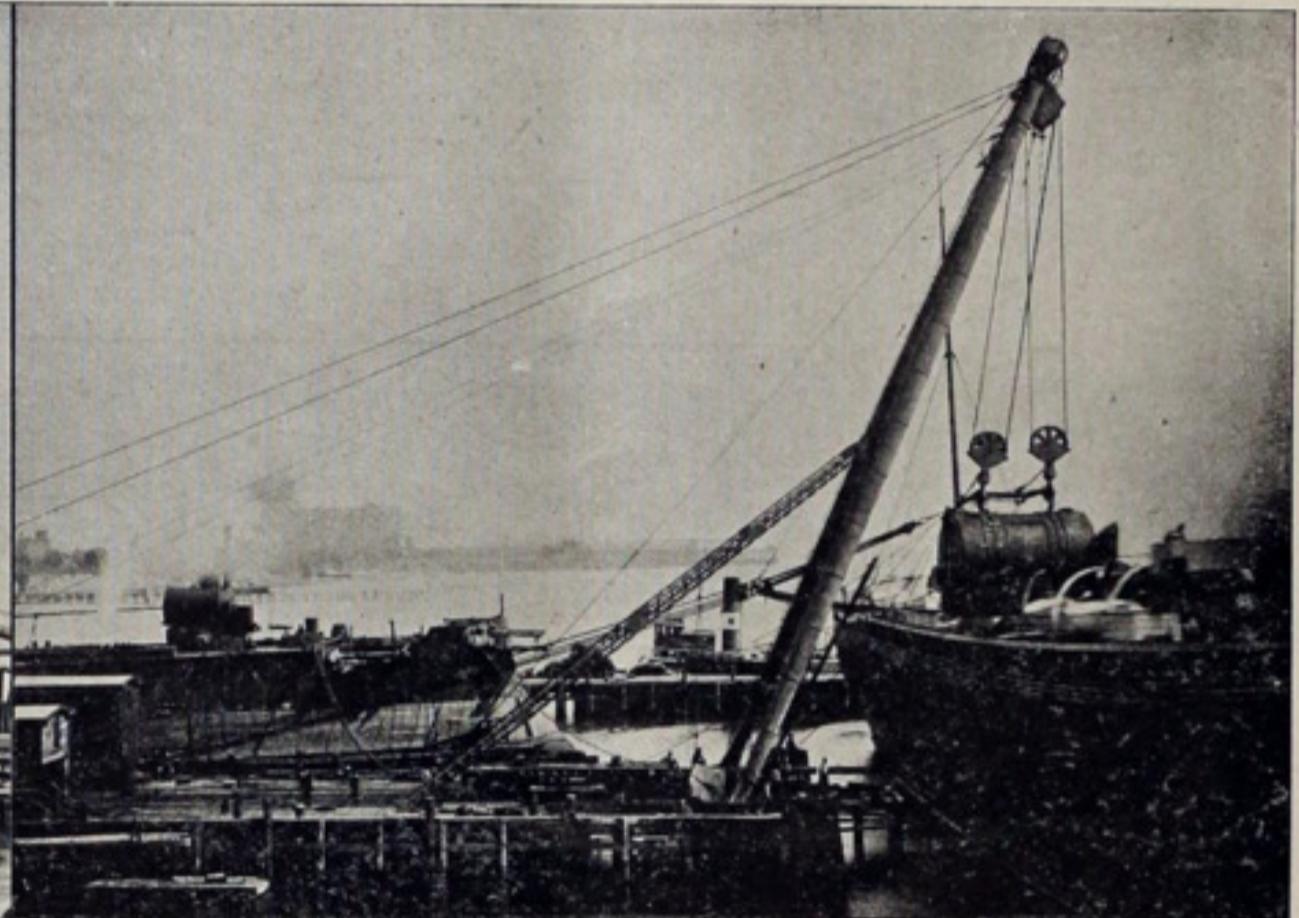
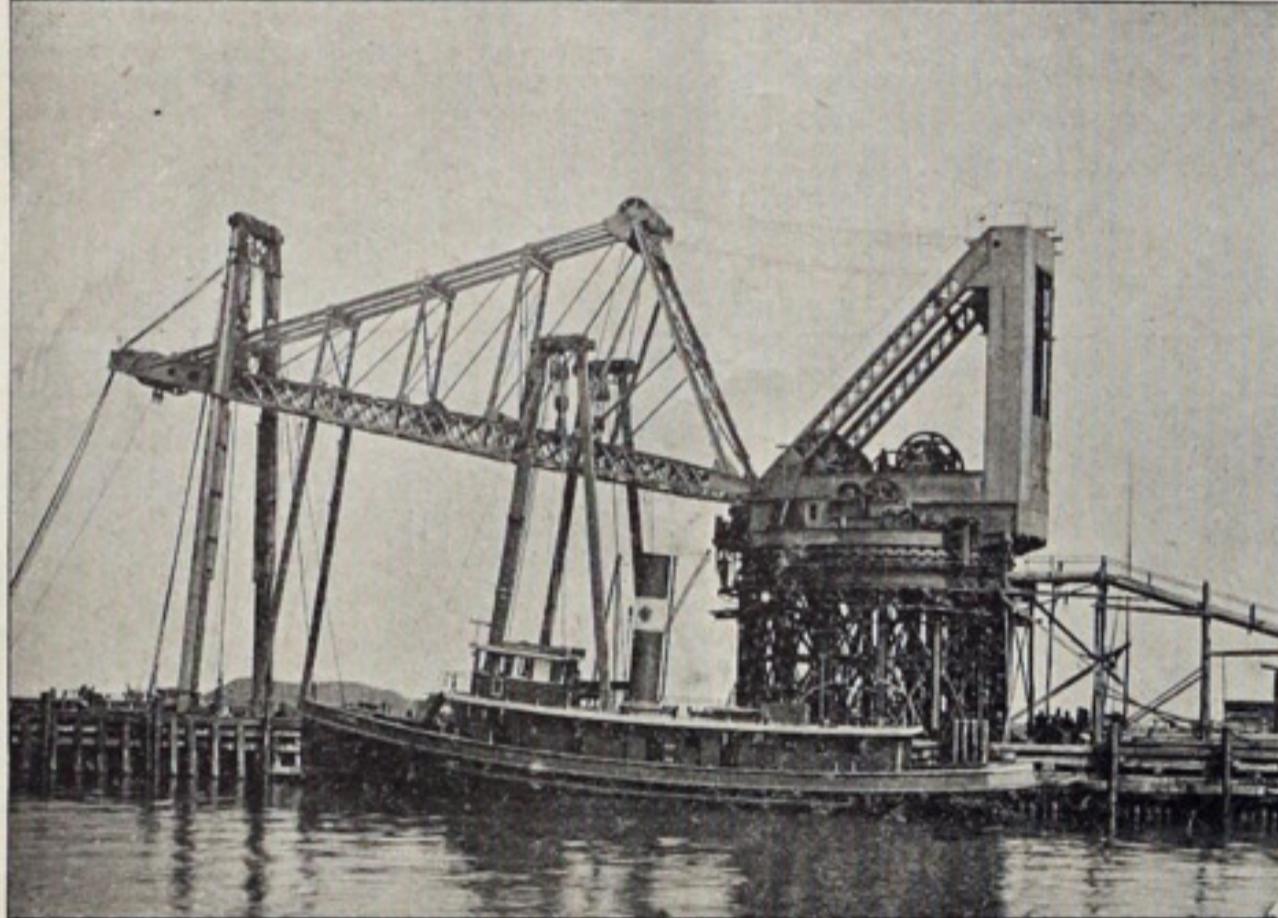
The main air pipe has an aggregate length of about 1,500 feet. It is of cast iron with leaded joints and measures 8 inches inside diameter

work around the yard there is utilized a see-saw arrangement, consisting of a beam supporting the riveter at one end with a counter balance at the other. The beam rests on an A frame carriage and is allowed a great latitude of movement.

DERRICKS AND CRANES.

ELEMENTS OF ECONOMY AND CONVENIENCE THAT HAVE DISTINGUISHED THE
NEWPORT NEWS WORKS—REVOLVING DERRICK OF 150 TONS
CAPACITY—BROWN CANTILEVER DEVICES FOR
SERVING SHIPS UNDER CONSTRUCTION.

Two of the most valuable adjuncts of these works are found in the shears of 100 tons capacity and the electrically operated 150-ton revolving derrick Hercules. This giant machine was designed, built and erected by the Newport News Co., the steel tower being furnished and erected by the Berlin Iron Bridge Co. of East Berlin, Conn., and the foundations designed and constructed under the direction of Superintendent Walter A. Post. The derrick jib is capable of having its outer end raised or lowered, thus giving to the hoisting blocks, which depend vertically from this end, a movement not only of rotation about the centre of the derrick, but also of translation in and out from the center. With the outer end of the jib in its lowest position the hoisting blocks



150-TON REVOLVING DERRICK HERCULES.
BROWN TRAVELING SHIP CRANE.

with reductions at intervals to 6 inches and then to 5 inches. It enters at the end of a reheat 27 inches in diameter by 6 feet long, very similar to a surface condenser and with wrought iron tubes 1¼ inches in diameter. It is there reheated by the exhaust air from one of the shop engines and this reheated air is utilized to run a regular type Atlas horizontal steam engine that furnishes power for a large band sawmill. The sawdust from this mill is forced away by the exhaust air from this engine. The diameter of the air pipe to the engine is 3½ inches and the exhaust 4½ inches, and air is also supplied from the reheat to a small motor for a saw grinding machine. It is claimed that the pressure gauge will register at any point in the system the same as the main tank. From the storage tank also lead four other wrought iron mains, consisting of two 4-inch, one 3-inch and one 2½-inch. All pipes are, of course, buried below the frost line.

Power sufficient for twenty-eight No. 2 Boyer hammers, manufactured by the Chicago Pneumatic Tool Co., as well as four drills, is furnished by the 2½-inch main. Much of the equipment of the plant has been furnished by the Chicago Pneumatic Tool Co., and the Q. & C. Co. of Chicago, although almost all other manufacturers are represented. For work in the frame sheds, on bulkheads and reverse frames the Caskey or single-squeeze pneumatic riveter is used. For general

100-TON SHEAR LEGS HOISTING BOILER ABOARD LA GRANDE DUCHESSE.
BROWN CANTILEVERS AND SCAFFOLDING.

will, on rotation of the derrick, describe the circumference of a circle 207 feet in diameter; with the jib in its highest position these blocks on rotation describe the circumference of another concentric circle 88 feet in diameter, thus permitting the derrick to operate on weights lying anywhere within the circle ring, whose maximum and minimum diameters are 207 and 88 feet respectively.

The maximum load of 150 tons can be handled only within a ring whose maximum and minimum diameters are 147 feet and 88 feet respectively, but weights up to 70 tons may be handled throughout the entire field of operation. The maximum elevations above mean high water for the hoisting hooks in the high and lower positions of the jib are 118 and 69 feet respectively, sufficient to give ample clearance vertically for any probable conditions. The foundation is of creosoted piles and cost in the neighborhood of \$8,000.

The derrick is revolved by duplicate sets of machinery, each consisting of one No. 800 General Electric railway motor, capable of developing 20 horse power and driving, through means of a double threaded worm and wheel of the Albro-Hindley pattern, a pinion which, engaging a horizontal circular rack on the outside of the tower, gives the required movement of rotation. The motors are series-wound and controlled from a series parallel controller, giving high efficiency under

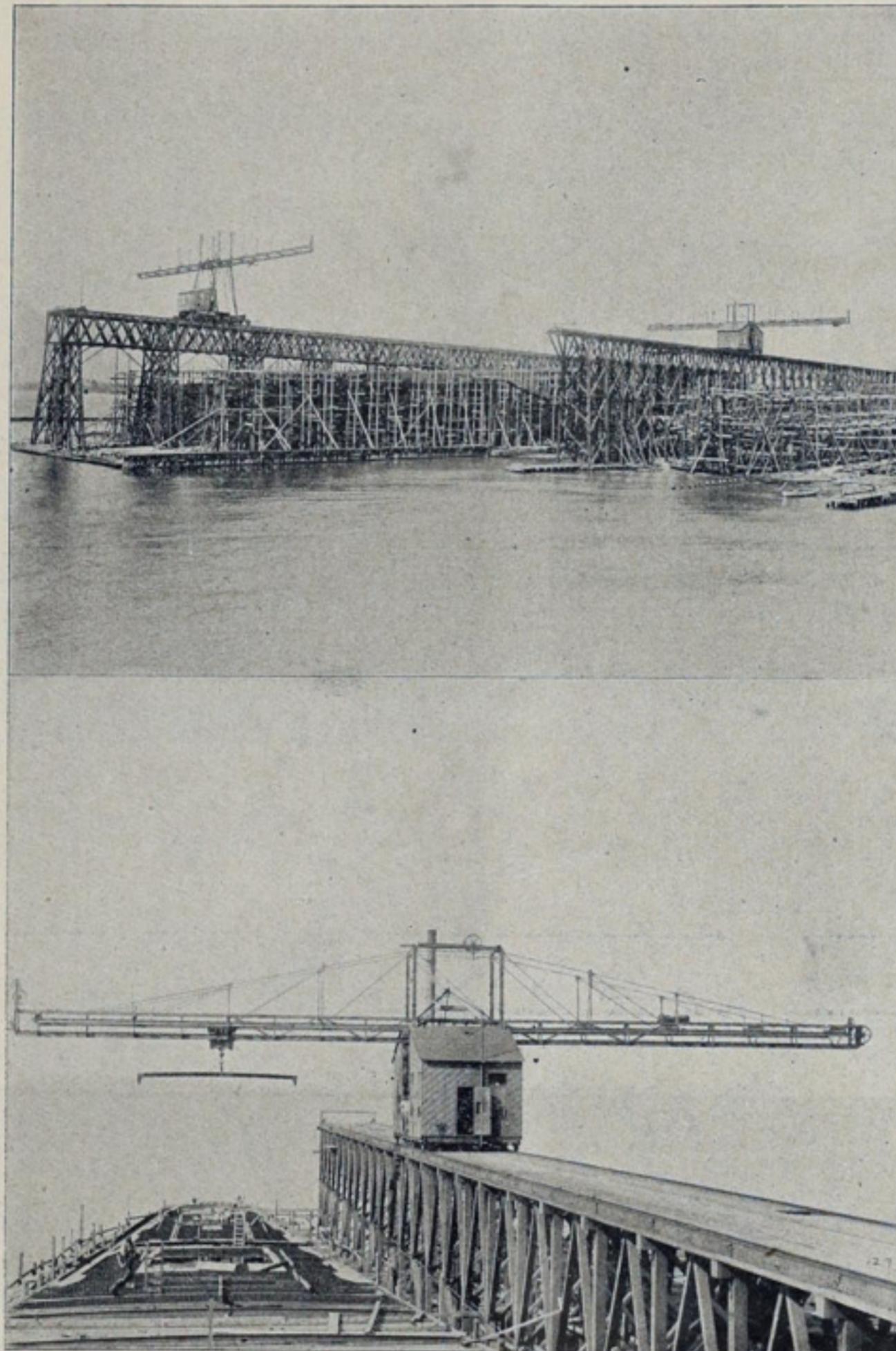
starting conditions as well as at normal speed. The turning motion is very smooth and perfectly noiseless, and requires very little power. The ropes for the hoist and racking movements are all of plough steel wire $1\frac{1}{4}$ inches in diameter, of 6 strands of 37 wires each, with hemp center and very flexible. Each rope has a breaking strength of 100,000 pounds.

CANTILEVER CRANES—FOR SHIP YARD AND BUILDING WAYS.

The Newport News plant is distinguished among the ship yards of the world by reason of the magnitude of its equipment of steam and electrically-operated ship building and ship yard cantilever cranes. The five cranes which constitute this equipment were furnished by the Brown Hoisting & Conveying Machine Co. of Cleveland. The plan of operation of these cranes is an excellent combination of the elements which make for economy and convenience. A high trestle has been erected between each pair of ship ways. Upon the track on top of this trestle is mounted one of the balanced cantilever cranes. The trestle and crane bring the horizontal boom of the crane high enough above the ship ways to pass over the highest point of the ships being built. The arms of the cantilever project entirely over the full width of the ships on either side of the trestle. By means of trolley and hoist block, mounted

the installation of the patent balanced cantilever derrick used for general yard service—unloading iron and machinery from cars, transferring material from shop to shop and to the Brown ship building crane, as mentioned above. The length of tramway is 130 feet and the working load from 3 to 10 tons. The speed hoisting is from 150 to 50 feet per minute; trolley on tramway 500 feet per minute, and derrick on track 200 feet per minute. The derrick revolving will make $1\frac{1}{2}$ revolutions per minute and the capacity of scale on tramway is 15 tons.

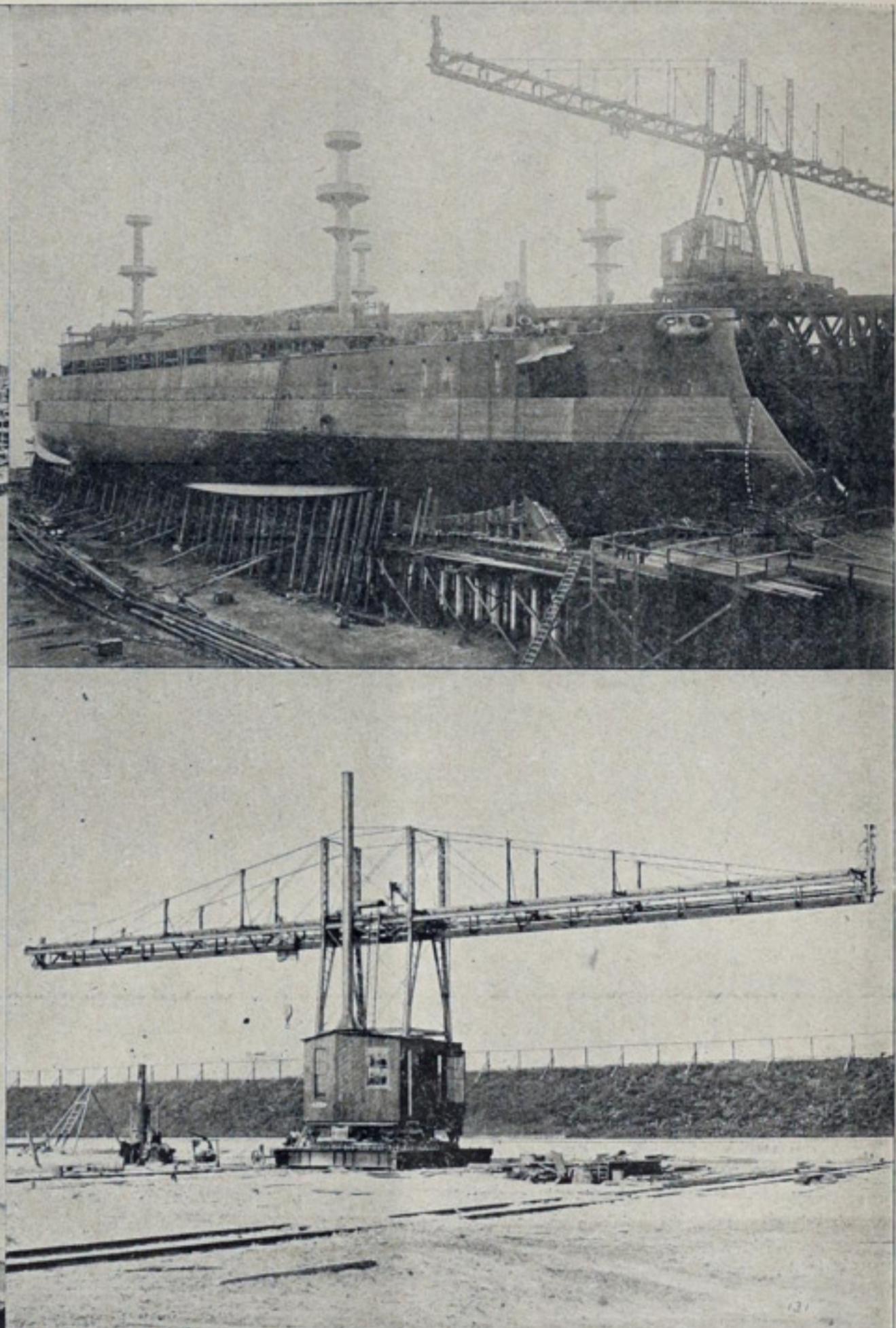
The first of the electrically-operated ship yard cranes was installed in 1893 and was followed in 1899 by two others. The length of tramway in the case of each is 187 feet 4 inches. The working loads range from 9,000 pounds 89 feet from the center, to 28,000 pounds 55 feet from the center. The trolley will attain any speed desired on the tramway, while the speed of the crane on the track equals 750 feet per minute with 9,000 pounds 89 feet from center, or 690 feet with 28,000 pounds 55 feet from center. The clear height under boom at lower end of yard is 100 feet. The trestles for the first cranes installed were built of wood, but steel has been utilized for the more recent structures, which have been erected by the Edgemore Bridge Works of Wilmington, Del. Some very remarkable records from the standpoint of economy of time have



BROWN ELECTRIC CANTILEVERS—FROM THE HARBOR.
STEAM TRAVELING CRANE MANUFACTURED BY BROWN CO.

on the cantilever of the crane, the load can be hoisted from the ground and traversed from one end of the cantilever to the other, as the pier or base of the crane is arranged so that the load passes through it. As the crane travels up and down the trestle on which it is mounted, by its own power, the entire length and width of both ships are covered by the extent of the motions of the crane, and materials can be handled and delivered to any part of the ships being built. Only one man is required to operate all the motions of the crane, but an assistant travels with it to handle and guide the plates on either side of the trestle as they are needed, or to hook on the plates as they are placed on the platform of the pier. The yard crane is designed to take materials from the tracks running through the yard. It either places the plates in crates or racks built for them in the yard, ready to be used at any time in the shops, or takes the finished plates from the shops on either side of the track on which it runs and delivers them to the end of the ship crane trestle. Here, as they are needed, they are picked up by the cantilever ship crane and lowered and held in position until bolted to the frames of the ship.

The first ship building crane was installed in 1891. It is operated by steam, has a tramway 130 feet in length, and is capable of handling a working load of from 3 to 10 tons. The speed hoisting is from 150 to 50 feet per minute; of the trolley on the tramway 500 feet per minute, and of the crane on the track 300 feet per minute. The same year saw



BATTLESHIPS KEARSARGE AND KENTUCKY—UNDER BROWN CRANES.
YARD CRANE MANUFACTURED BY BROWN HOISTING CO.

been made since these cranes were installed. It will be readily appreciated, indeed, that all the speeds of hoisting and lowering must necessarily be very rapid to allow a crane to handle material for two ships under construction at the same time and to be economical by not keeping the workmen waiting for material. Electricity as a motive power in this regard has been proven to have many advantages over steam.

As has been stated the Newport News yard has an aggregate area of 120 acres, of which the buildings cover fully 10 acres. There are eight ways and six piers. The latter with their dimensions are as follows: No. 1, 60 by 900 feet; No. 2, 60 by 850 feet; No. 3, 191 by 800 feet; No. 4, 80 by 550 feet; No. 5, 60 by 750 feet, and No. 6, 60 by 500 feet. There is also an outfitting basin 500 by 900 feet in size.

ENORMOUS CAPACITY FOR SHIP REPAIRS.

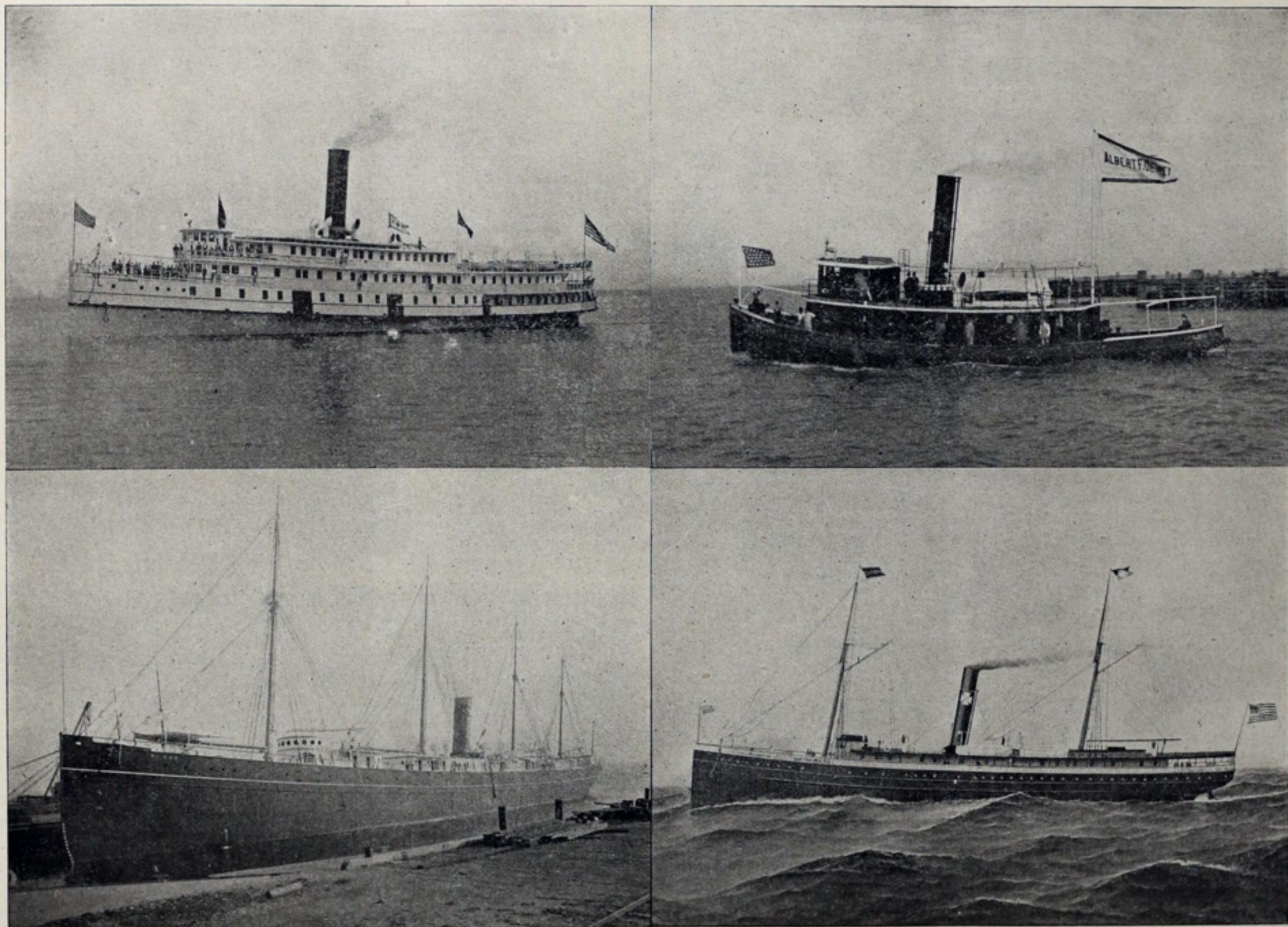
The enormous capacity of the Newport News plant for repair work was proven to be all that has been claimed for it by the manner in which the exactions of the period of the Spanish-American war were met. All the available workmen were secured, and men and officials alike worked from 16 to 18 hours a day, some of the former drawing as much as \$200 a week in consequence of the overtime put in. The auxiliary cruisers *Yosemite* and *Dixie* were fitted out in three weeks each, and the transformation of the hospital ship *Solace* was made with great rapidity considering the amount of work to be done. Just pre-

vious to the outbreak of the war, elevating gear for the 8-inch guns had been installed on the cruiser Brooklyn at the yard, and this was followed by a thorough overhauling of the cruiser Minneapolis. The American liners were equipped for service as Harvard and Yale, extensive repairs were made to the colliers Justin and Caesar, and some work was done on the battleship Massachusetts.

The Morgan line tug built at this yard soon after its establishment was refitted for service as the Accomac and was actively engaged during the war, as were also the tugs Dewey and Sommers N. Smith, which were utilized as newspaper dispatch boats. The Plant liner La Grande Duchesse was fitted out as a transport and repairs were made to the transports Panama, Chester and Obdam, as well as the repair ship Vulcan, and also to the ram Katahdin and the monitor Puritan, which stopped at Newport News on the way south for general repairs. The Manitoba will be transformed into a regular army transport at this yard during 1899. Of course the ship yard was well represented in the war fleet. The gunboats Nashville, Wilmington and Helena and the four transformed Morgan liners coming in for a special share of praise by reason of their service during the conflict.

The third contract entered on the books of the company was for the steamer El Sud, and marked the beginning of close relations since maintained between the Southern Pacific Co.—the Morgan line—and the Newport News Co. El Sud, which during the Spanish-American war was purchased by the United States government and rechristened the Yosemite, was launched in March 1892. She is an iron, schooner-rigged, four-masted steamer, 389 feet in length, 48 feet beam, 23 feet 9 inches depth, 20 feet mean draught, 6,179 tons displacement, and 4,659 gross or 2,901 net tons burden. She is fitted with single-screw vertical inverted triple expansion engines of 3,800 horse power, having cylinders of 32, 52 and 84 inches diameter by 54-inch stroke. Steam is supplied from three double-ended return tubular boilers, 13 feet 10 inches in diameter by 20 feet 6 inches length, allowed a working pressure of 165 pounds per square inch. Her speed is 16 knots and her bunker capacity 1,371 tons. Previous to the purchase of this vessel by the government, she was engaged in the service of the Morgan line between New York and New Orleans.

Following El Sud came El Norte, a sister ship launched in June, 1892, and also engaged in the coastwise service of the Morgan line until purchased by the navy department of the United States and placed in service April 14, 1898—one day later than her sister ship—as the auxil-



STEAMER NEWPORT NEWS.
FORMER MORGAN LINER EL SUD.

A LONG LIST OF CONTRACTS.

WHAT THE NEWPORT NEWS COMPANY HAS BUILT AND WHAT IT NOW HAS
UNDER WAY—WORKING OUT ORDERS FOR BATTLESHIPS, A MONITOR,
SEVERAL COASTING STEAMERS AND TWO PACIFIC LINERS.

The work turned out at Newport News has included, of course, everything from tugs to the heaviest battleships for the United States navy. The first contract closed was for the construction of two tugs—the Dorothy for the New York & Northern Railway Co., and the El Toro for the Pacific Improvement Co. These sister vessels are each 90 feet over all, 19 feet beam, 10 feet 9 inches deep, 9 feet draught and of 130 gross or 65 net tons burden. They are fitted with four-cylinder quadruple expansion engines of 250 horse power, with cylinders 9 3/4, 13 1/2, 18 3/4 and 26 inches diameter by 22 inches stroke, to which steam is supplied from one cylindrical return-tubular boiler with a working pressure of 180 pounds. Their displacement is 187 tons each, speed 10 knots and bunker capacity 35 tons. The launching of both vessels occurred in January, 1891, and they went into commission in the April following. The Dorothy is now in the service of the New York City Lighterage Co., while the El Toro was purchased from the Southern Pacific Co. by the United States government at the outbreak of the Spanish-American war for \$40,000, and after being renamed the Accomac went into commission in the United States navy April 2, 1898.

TUG ALBERT F. DEWEY.
PLANT LINER LA GRANDE DUCHESSE.

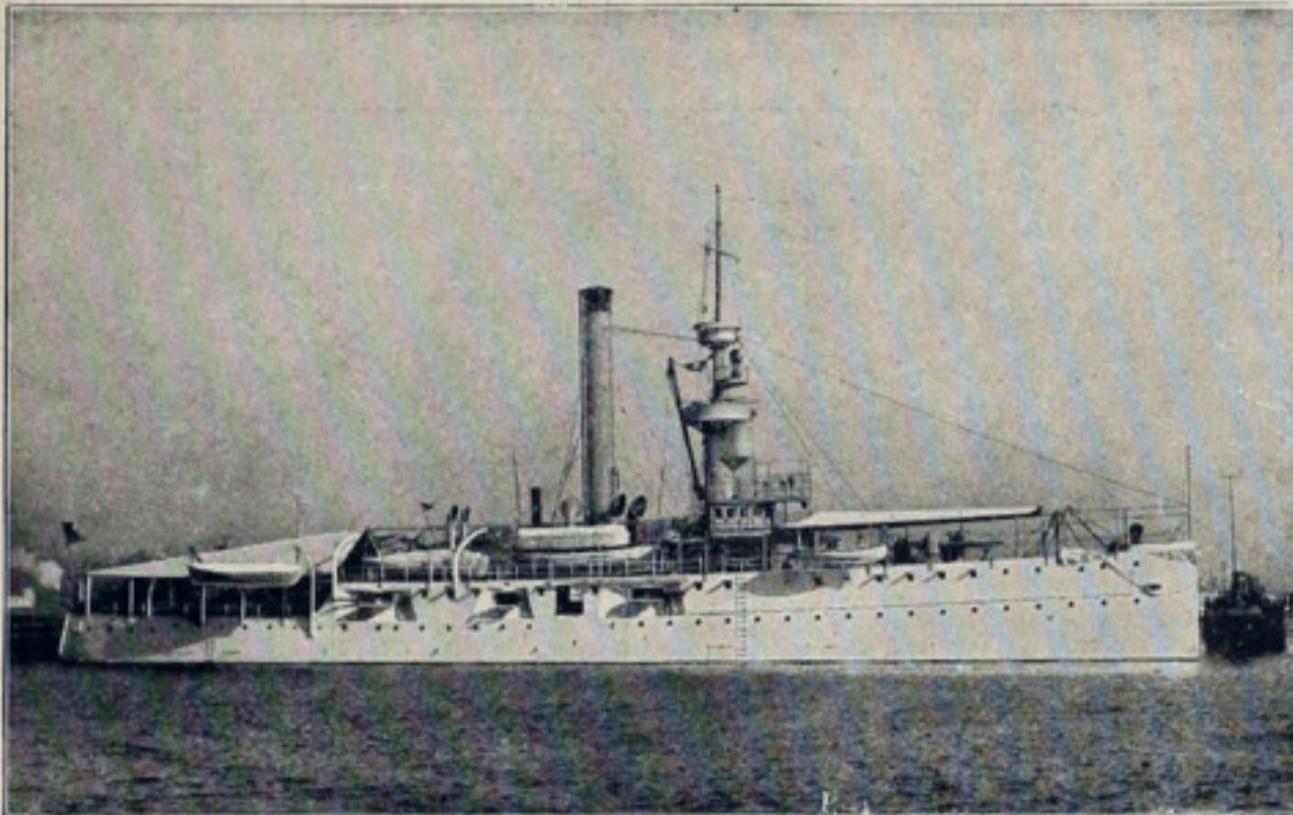
rary cruiser Yankee. The El Rio, now the U. S. S. Dixie, was the third vessel constructed by the company for the Morgan line, and is identical with the other vessels in dimensions and appearance, save for the fact that she has two instead of four masts. She was launched in May, 1893, and was followed shortly after by the El Cid, now the cruiser Buffalo, which is in all essentials a sister vessel, although of slightly less horse power and speed. El Cid was for a time in the New York-New Orleans service of the Morgan line, but during an insurrection in Brazil some years ago was sold to that government, fitted with dynamite guns and renamed Nictheroy. At the outbreak of the Spanish-American war, however, the United States government purchased her from Brazil, and she was again rechristened, this time being given the appellation Buffalo. It will thus be seen that with the single exception of the El Sol (Prairie), the Newport News company built all of the Morgan liners which did such effective service as auxiliary cruisers in the Atlantic squadron during the continuance of the Spanish-American war. For these vessels the United States government paid \$575,000 each.

FIRST CONTRACT FOR NAVAL VESSELS.

The year 1894 saw the acquisition by the company of its first contract for naval vessels for the United States government, contracts being signed during the latter part of January of that year for the gunboats Nashville, Wilmington and Helena. Each of the three vessels was authorized by the act of congress of March 3, 1893, and the contract price in each case was \$280,000. The contract for the Nashville was signed

Jan. 22, 1894, the keel was laid August 9, 1894, and she was launched Oct. 19, 1895. Her contract date of completion was Jan. 22, 1896, but she did not go into commission until August 19, 1897. She is a schooner-rigged vessel, 220 feet on the load water line, 38 feet beam, 11 feet draught on 1,371 tons displacement, and is of 1,190 gross or 907 tons net burden. She is fitted with twin-screw vertical quadruple expansion engines of 2,536 indicated horse power; has a normal coal capacity of 150 tons; a bunker capacity of 400 tons, and shows 13.16 tons per inch immersion on normal draught. The Nashville made her trial trip May 14, 1897, and attained an average speed of 16.29 knots. Inasmuch as the contract speed of the Nashville was 13.6 knots, and the stipulations of the contract provided further for the payment of a bonus of \$20,000 for each knot in excess of the contract speed, the record attained on trial earned for her builders the sum of \$55,000.

The gunboats Helena and Wilmington are sister ships and were designed with light draught, so as to fit them especially for river service. The contract for these two vessels was signed Jan. 29, 1894, a few days later than that for the Nashville. The keels were laid in October of that



GUNBOAT HELENA (DUPLICATE OF WILMINGTON) BUILT AT NEWPORT NEWS.

year and the Helena was launched Jan. 30, 1896, and the Wilmington Oct. 19, 1895. The former went into commission July 8, 1897, and the latter May 13, 1897. The two gunboats are identical in every respect and are 250 feet 9 inches on the load water line, 40 feet beam, 9 feet draught on a displacement of 1,387 tons and are of 1,362 gross or 1,074 net tons burden. They are fitted with twin-screw vertical triple expansion engines of about 1,900 horse power, and are capable of attaining a speed of 15 knots. Normal coal supply is 100 tons; bunker capacity 300 tons, and 17.08 tons per inch immersion at normal draught. The trial trips of the vessels were made on Long Island Sound, the Wilmington making the run March 27, 1897, and the Helena March 29, 1897. The Wilmington attained 15.13 knots and the Helena 15.85 knots, each earning a handsome bonus thereby.

The next ship yard contract was for a diagonal inclined engine for the ferry boat Twin Cities, designed for service between Norfolk and Portsmouth, Va., and this was followed by an order for a triple expansion engine for the Cromwell line steamer Louisiana. The latter has cylinders of 24, 39 and 64 inches diameter by 45 inches stroke, and steam is furnished from two double ended return-tubular boilers, with a working pressure of 170 pounds. Then came a commission for the steam pilot boat John H. Estill, built in 1894 for the Savannah Pilots' Association. She is 130 feet over all, 117 feet keel, 23 feet beam and of 243 gross or 121 net tons burden. This vessel was contracted for April 17 of the year mentioned and completed a few months later.

No ill luck attached to the tug Albert F. Dewey which was the thirteenth vessel to be launched from the Newport News yard. She was built in 1895 and is 91 feet long by 19 feet beam and of 134 gross or 67 net tons burden. The tug was contracted for in October, 1894, and launched Jan. 31, 1895, and was named for her owner, A. F. Dewey of Punta Gorda, Fla. She proved a very speedy boat and saw service during the Spanish-American war as a newspaper dispatch boat. Next came the steamer Newport News, contracted for in November, 1894, and launched in April, 1895, for the Norfolk & Washington Steamboat Co. She is 274 feet long, 46 feet beam, 16 feet 6 inches deep, and by reason of her record of 21 miles per hour in regular service is considered one of the speediest freight and passenger steamers on Chesapeake bay.

The Plant liner La Grande Duchesse is a vessel which has by her record proven a considerable credit to her builders. She was contracted for in April, 1895, and was launched January 30, 1896, at the same time as the gunboat Helena. La Grande Duchesse, which during the Spanish-American war was utilized as an army transport in the service of the United States war department, is a schooner-rigged vessel 404 feet long, 47 feet beam, 36 feet 6 inches depth, 5,018 gross or 3,006 net tons burden. She was designed for coastwise traffic—freight and passenger—between Savannah and New York City, and has three steel and one wooden deck. She is fitted with two four-cylinder quadruple expansion engines with cylinders of 24, 34, 48 and 68 inches diameter by 42 inches stroke. The original boiler installation consisted of eight water tube, 12 feet 6 inches in diameter by 11 feet 6 inches in length with a working pressure of 250 pounds per square inch, but these have since been replaced by Scotch boilers.

Next in the list of ships built is the Creole, a vessel that has by its record proven an unqualified endorsement of the character of the work performed at this plant. This vessel, launched August 8, 1896, was built for the Cromwell line and was for a time in service between New York and New Orleans, but was sold during the Spanish-American war for \$600,000 to the navy department and transformed into the hospital

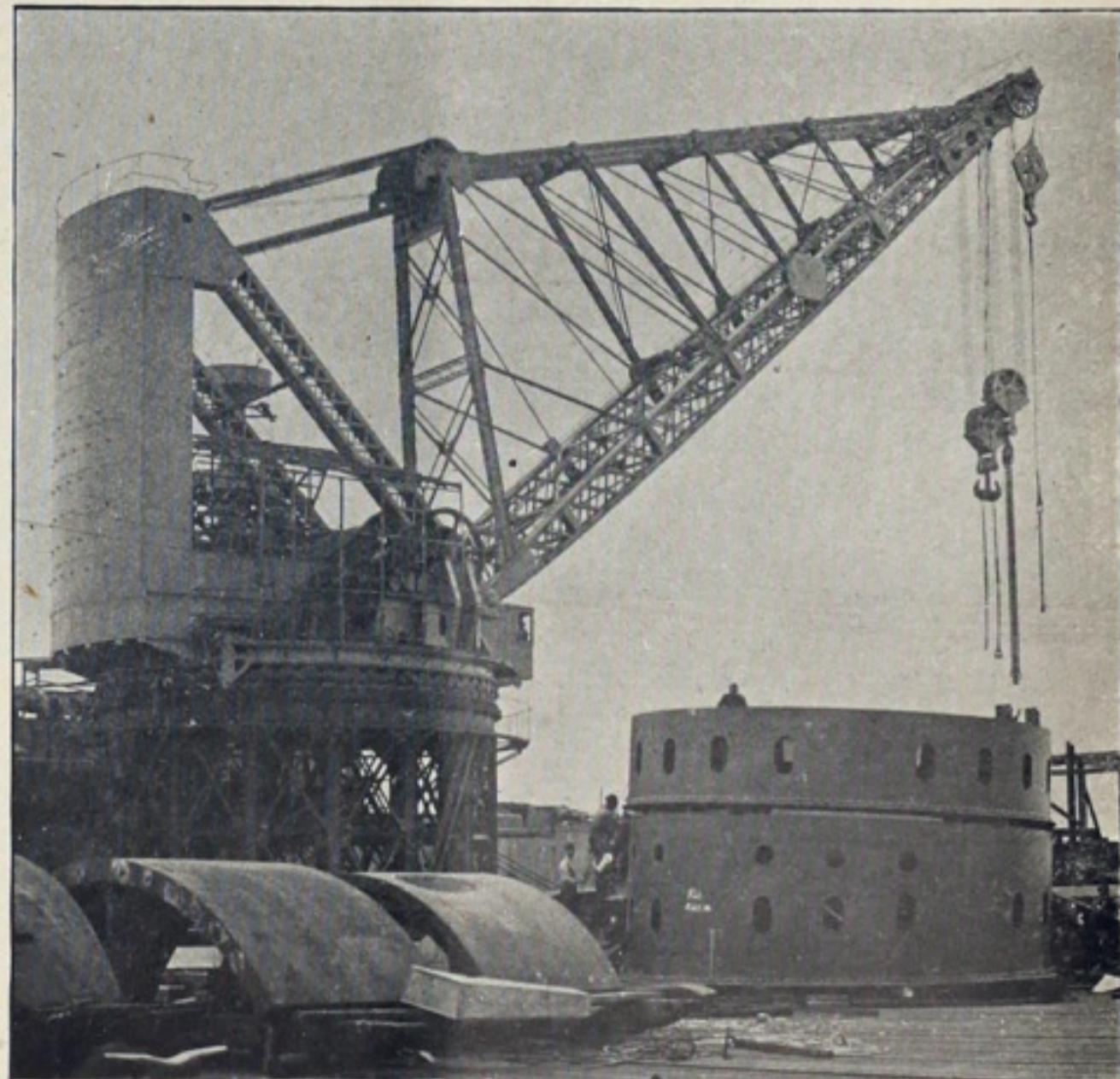
ship Solace. This steamer is 375 feet in length over all, 352 feet on the water line, 44 feet beam, 32 feet 6 inches depth, 17 feet draught, 4,700 tons displacement, 3,801 gross or 2,362 net tons burden. She is fitted with single screw, vertical inverted triple expansion engines of 3,200 horse power, with cylinders of 28.44 and 74 inches in diameter by 54 inches stroke. Steam is supplied from three double-ended return-tubular boilers, 12 feet 7½ inches in diameter by 20 feet 3 inches in length, with a working pressure of 180 pounds. The bunker capacity is 800 tons and the speed of the vessel 15 knots. The Creole went into commission for the Cromwell line Nov. 6, 1896, and entered the service of the United States navy department April 14, 1898.

Another vessel constructed at the Newport News yard which has demonstrated her general efficiency by hard service is the tug Sommers N. Smith, which was utilized as a newspaper dispatch boat during the Spanish-American war. She was built for the Pilots' Benevolent Association of Pensacola, Fla., and is 115 feet over all, 21 feet beam, 211 gross or 79 net tons burden. She was launched May 30, 1896. With the Smith was launched the Margaret, the first side-wheel steamer to be constructed at the Newport News yard. She was built for the Plant line and is especially designed for sound, river and bay service, plying in Southern waters in the winter and in the vicinity of New Haven, Conn., in the summer. She is 182 feet over all, 44 feet over the guards, 8 feet depth, 675 gross or 380 net tons. She is fitted with compound engines with cylinders of 17 and 34 inches diameter by 48 inches stroke, and steam is supplied from one cylindrical return-tubular boiler, 11 feet 9 inches in diameter by 11 feet 9 inches in length, with a working pressure of 110 pounds.

CONTRACTS FOR BATTLESHIPS.

In 1896 the Newport News company again entered the field as contractors for government work, when they secured contracts for the battleships Kearsarge and Kentucky, which were authorized by the act of congress of March 2, 1895. The contract with the Newport News company for these vessels was signed Jan. 2, 1896. The keels were laid June 30, 1896, and the vessels were launched March 24, 1898. The contract date of completion was Jan. 2, 1899, and they would have been completed months before that had it not been for the delays experienced in securing armor. The contract price of each battleship, irrespective of armor and armament, was \$2,250,000. The Kearsarge and Kentucky have been described so frequently in the columns of the Review that all readers must be familiar with their general characteristics. They are each 368 feet on the load water line, 72 feet beam, 23 feet draught, 11,525 tons displacement and of 6,831 gross or 5,164 net tons burden, and driven by twin-screw vertical triple expansion engines of 10,000 horse power, calculated to produce a speed of 16 knots.

On Sept. 26, 1896, the company was awarded the contract for the construction of the battleship Illinois, which had been authorized by act of June 10, 1896, at a contract price of \$595,000. The keel was laid Feb. 10, 1897, and the vessel launched Oct. 4, 1898. The Illinois is 368 feet on the load water line, 72 feet beam, 23 feet draught, 11,525 tons displacement, 6,802 gross or 5,144 net tons burden and propelled by twin-screw vertical triple expansion engines of 10,000 horse power, which are calculated to drive the battleship at a speed of 16 knots per hour.



150-TON REVOLVING DERRICK HERCULES.

Following the Illinois came the contract for the battleship Missouri, which was awarded to the Newport News Co. on a bid of \$2,885,000, Oct. 11, 1898, the vessel having been authorized by the act of May 4, 1898. This vessel, which is to be completed June 11, 1901, will be 388 feet on load water line, 72 feet beam, 23 feet 10 inches draught, 12,500 displacement and driven by twin-screw vertical inverted triple expansion engines of 16,000 horse power, calculated to produce a speed of 18 knots. The act of May 4, 1898, also authorized the construction of the monitor Arkansas, to be built by this company. The contract

price originally stipulated was \$860,000, but owing to changes in the plans, made by the navy department, it was increased to \$960,000. The contract was signed Oct. 11, 1898, and stipulation made that the vessel be completed by Jan. 11, 1901. She will be 225 feet on the load water line, 50 feet beam, 12 feet draught, 2,755 tons displacement and will be driven by engines of 2,400 horse power designed to give a speed of 12 knots.

THE NEW MORGAN AND CROMWELL LINERS.

During 1898 contracts were secured for four steamers for the Southern Pacific Co.—Morgan line—to replace those sold to the government, as previously mentioned. The new vessels, which will approximate in cost \$600,000 each, will be named El Alba, El Dia, El Siglo and El Libre, and are designed for service on the route between New York City and New Orleans. Construction of these vessels is under the personal superintendence of Mr. Horace See, naval architect of No. 1 Broadway, New York. The new Morgan liners are of the following dimensions: Length over all, 406 feet; length between stem and propeller post, 380 feet 8½ inches; breadth moulded, 48 feet; depth moulded to awning deck, 33 feet 9 inches; gross tonnage, 4,665 tons; net tonnage, 2,905 tons.

Hulls are of steel throughout, the outside plating having vertical lap joints below the water line. They have three continuous decks and partial orlop deck at forward end of forehold. They are rigged with two steel pole masts and necessary booms for handling cargo, together with steam hoisting engines located at the different hatches. The deck houses, as in the case of all of the late vessels of the Morgan line, will be of steel, with round side lights. Each vessel will have two cross hatches, with an improved arrangement of covers for convenience in handling, etc. The rudders are to be built up with center plate and made with stock in two pieces, coupled together below counter. The vessels are provided with steam steering gear at forward pilot house, and a screw hand gear at the after house. There is one Ritchie compass with Hand's binnacle and stand in the pilot house, one Ritchie compass with brass binnacle and stand on the bridge; one Sir William Thomson's compensating binnacle compass on main house, and one Ritchie liquid compass in after house. A flying bridge connects the forward house with the main house. Steam windlass and steam capstans are provided for handling anchors, hawsers, etc.; complete electric light plant, with 112 incandescent lamps of 16 candle power each in engine room, deck houses and crew space; portable lamps in cargo space; masthead light of 50 candle power; side lights, and a powerful search light placed on a stand on foremast. This stand is arranged similar to the crow's nest on the transatlantic ships and can be used for a lookout; also a Russell-See running light control and indicator, connected with masthead and side lights, to be located in pilot house.

The engines are of the triple expansion type, with cylinders of 33, 52 and 84 inches diameter and 54 inches stroke. The distribution of steam in the high-pressure cylinder is controlled by one piston valve; another valve of the same type performs a similar duty for the intermediate cylinder, and two piston valves are used for the low pressure cylinder. The steam is introduced in the middle of high and intermediate valves, which prevents the high pressure steam from coming in contact with the valve stem stuffing boxes. All are worked by improved See-Marshall valve gear, with which each valve receives its motion from a separate eccentric. The valves are placed as close as possible to their respective cylinders. In the high pressure and intermediate valve gear, levers are introduced and connected to the valve stem and valve gear in such a manner as to cause the weight of the valve to counterbalance the weight of the connections below the lever, thereby dispensing with counterbalancing cylinders. The engines are reversed by steam and controlled by a governor. The main pistons are constructed so as to dispense with the employment of tail rods, and will at the same time insure their being steam tight without undue friction. The piston rods and the valve stems are fitted with metallic packing. The crank shaft is 16½ inches diameter; crank-pins, 16½ inches diameter by 16½ inches long; cross-head pins, 8 inches diameter, 9½ inches long. The shaft is fitted with adjustable thrust bearings, one for go-ahead and another for backing. The air pump, single acting, is 32 inches diameter, stroke 25 inches. Total cooling surface in condenser is 6,400 square feet. An independent centrifugal circulating pump is connected to the condenser, sea bilge and ballast tank. The propeller will be built-up, the hub being of iron and the blades of manganese bronze. Steam is furnished by three double-ended boilers, 13 feet 10 inches diameter and 20½ feet long. Each boiler contains six corrugated furnaces, 43 inches inside diameter. Total grate surface, 400 square feet; total heating surface, 10,650 square feet; working steam pressure, 180 pounds. There will be two See hydro-pneumatic ash ejectors, a closed grease extractor and all necessary conveniences for running and maintaining the machinery.

With the order for these vessels there was also given an order for a tug for the Morgan line, to be 96 feet in length, 22 feet beam and 12 feet depth, driven by vertical compound engines of 450 horse power, to which steam will be supplied from a Scotch boiler.

Shortly after this, contracts were also secured by the Newport News company for two steamers for the Cromwell line. These vessels, which were also designed by Naval architect Horace See of New York, are exact duplicates in dimensions, horse power and equipment of the Morgan liners above described. Early in 1899 the company closed contracts to build two steamers for the Pacific Mail Steamship Co., in which, by the way, Mr. Collis P. Huntington is a large stockholder. These vessels will each be 550 feet in length by 63 feet beam—the largest steamers ever built in America.

A visit to the national capital may be enjoyed without extra cost for fare in going to Philadelphia and New York over Pennsylvania short lines. Tickets to those points via Washington may be obtained at same fares as apply over Pennsylvania direct lines, and will be good for ten days' sojourn at the national capital. For particular information apply to Pennsylvania lines ticket agents or address C. L. Kimball, assistant general passenger agent, Cleveland.

FINEST FERRY BOAT AFLOAT.

THE PHILADELPHIA RECENTLY COMPLETED AT THE ROACH SHIP YARD, CHESTER, PA., FOR THE PENNSYLVANIA RAILROAD CO.—A MARVEL OF BEAUTY.

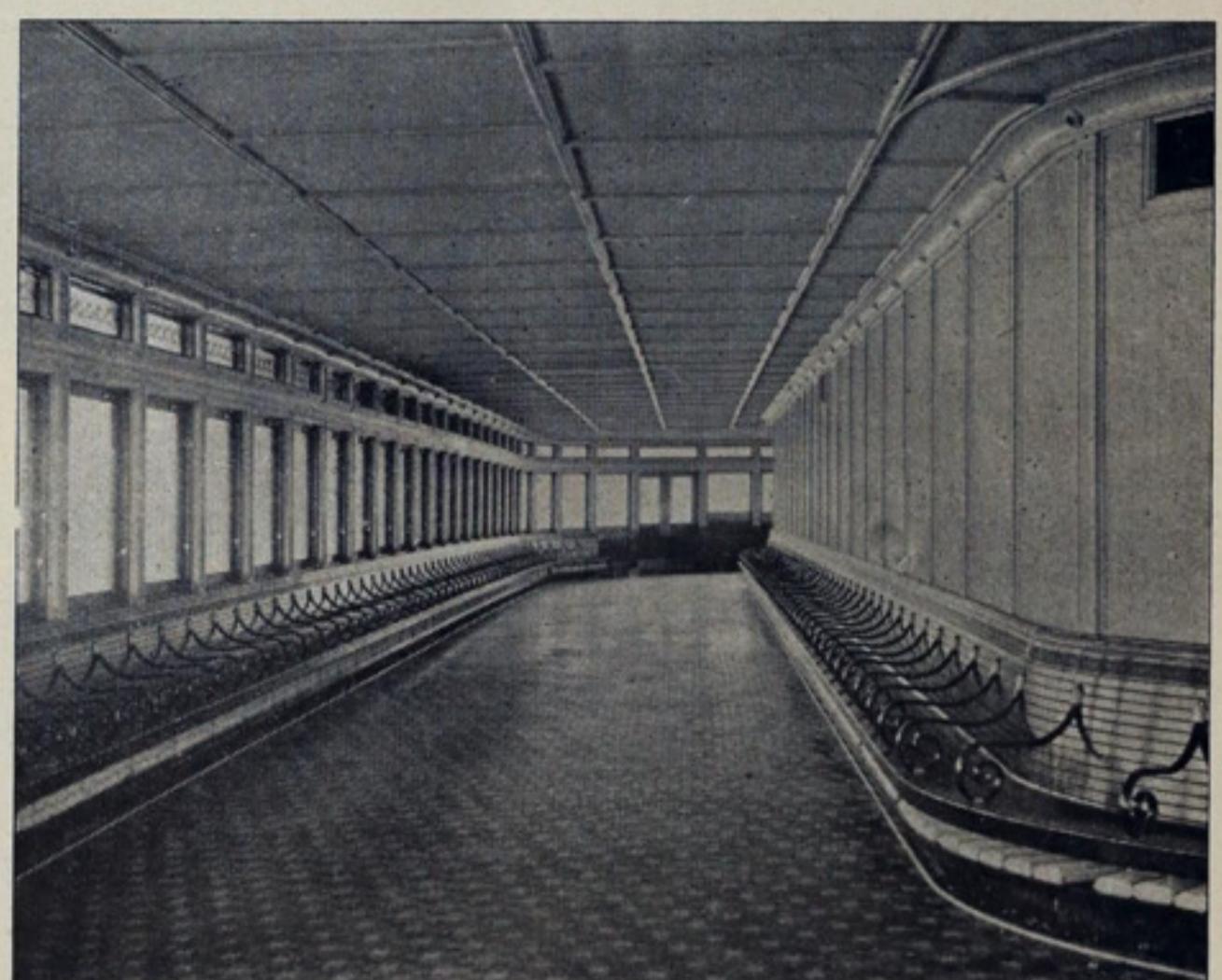
The Review presents herewith interior and exterior views of the splendid new ferryboat Philadelphia, just finished at Roach's ship yard, Chester, Pa., for the Pennsylvania Railroad Co. This vessel, which is probably the most handsomely finished and costly steamer for ferry service ever built, left the ship yard under her own steam this week and went outside to New York, where she will be immediately placed in service between Jersey City and Twenty-third street, in New York city. The photograph shows the vessel lying at one of the docks at the ship yard. In the distance are seen the Old Dominion steamship Hamilton under the shears receiving her finishing touches and the Pennsylvania



MEN'S SALOON, MAIN DECK—FERRY BOAT PHILADELPHIA.

ferryboat Camden, which is being re-engined at the ship yard. The interior views of the ferryboat show the handsome character of the fittings, the staff panels, handsome mahogany columns with their brass bases and capitals, and the paneled ceilings, with the carving and grills, making a very handsome effect.

The boat was built under the direct supervision and direction of H. S. Hayward, superintendent of motive power of the United Railroads of New Jersey, division of the Pennsylvania railroad, and his competent assistant, Frank L. DuBosque, who received his early training in ship building in Roach's yards. The Philadelphia is the result in her design and construction of the experience of years in the study of the require-



PART OF SALOON ON UPPER DECK—FERRY BOAT PHILADELPHIA.

ments of the service for which she is intended, and she represents the highest type of ferryboat in the world. She was launched on March 2, practically complete. Her construction was delayed somewhat owing to the unusually bad weather and the difficulty in getting material, but her owners have profited in securing the most careful workmanship in her construction.

Dimensions of the boat are as follows: 206 feet length over the guards, 200 feet long at the water line; beam moulded, 46 feet; beam over guards, 65 feet; depth amidship, 17 feet. She is driven by two sets

of compound engines with three cylinders each, high pressure 20 inches in diameter, low pressure 22 inches each, with a 24-inch stroke. Steam is furnished by four Thorneycroft water-tube boilers and there are four propellers, two at either end. They are of solid cast steel. She is fitted with steam steering gear and a complete electric light plant. All the decks are rubber interlocking tiled and the finishing of the panel work and the joiner and pressed work is in the regulation Pennsylvania railroad style. She has two decks, so that passengers can enter from the train floor or take advantage of the elevated view from the second deck. The stairs are broad and easy of ascent. The second deck is reached from the ladies' cabin. This arrangement was made so there would be no odor of smoke from the lower decks to the upper deck. The boat cost over \$200,000.

REMARKABLE PERFORMANCE OF THE SOLACE.

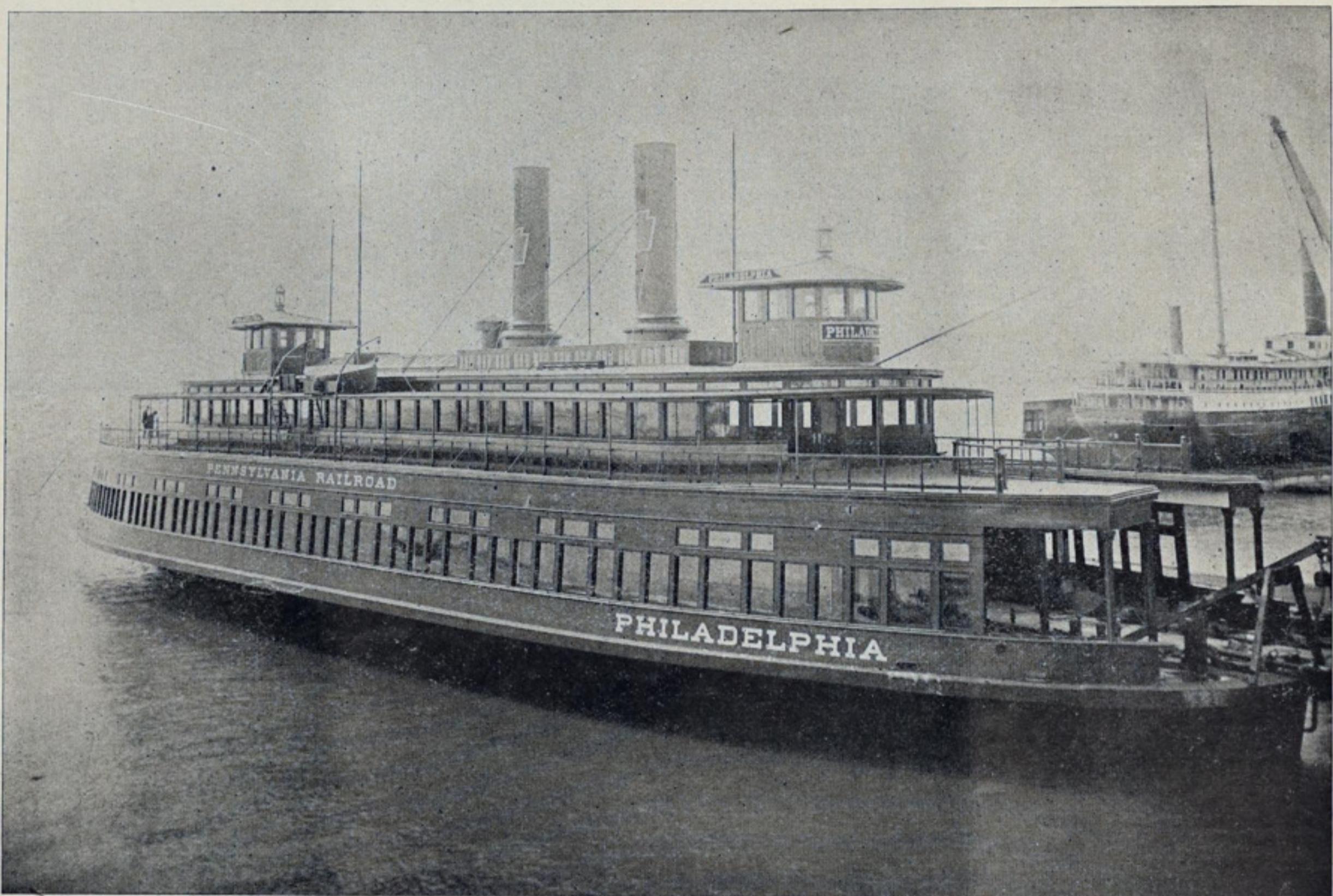
Friends of Horace See, naval architect of No. 1 Broadway, New York, are congratulating him upon the recent performances of the hospital ship Solace and the cruiser Dixie, both of which Mr. See designed. The run of the Dixie to Manila in fifty-four days was creditable but nothing like as remarkable as the performance of the Solace on her trip from Norfolk, Va., to Manila. This distance of about 11,670 knots was covered in forty-three days or at a rate of 11 1-3 knots per hour, with no allowance for slow speed through the canal or for any stoppages, as there are no particulars of this kind on which to base

WITHDRAWAL OF LACKAWANNA LINE.

Buffalo, March 30.—The sensation of the week in marine circles is the withdrawal of the Lackawanna line from the lake trade. This move was not thought of here last week and it had been announced as late as Thursday that the line would without doubt be made up as last season, from the Lackawanna and Scranton, which had been built for the line, and the leased boats America, Brazil and Gould. During the meetings of the lake line managers with the trunk lines in New York last week, it was given out that President Truesdale of the Lackawanna railroad did not want the lake line kept up, as it had never made any money and was more in arrears last season than ever. It was then arranged that the Anchor line should carry the Lackawanna freight, the line office being kept as before. The boats, Lackawanna and Scranton, have been turned over to Capt. M. M. Drake, who will probably put them into the ore trade. He had previously chartered the Russia of the line, together with the Cuba of the Mills interest, for the Lackawanna-Green Bay line, which he will keep up as usual.

Capt. Frank D. Welcome has been made the master of the new side-wheel steamer Pennsylvania, which is to run between Buffalo and Erie this season.

The elevator pool is formed and it is not, just as one's temperament happens to be. If he is of a sanguine turn he is sure that the thing is done, but if given to doubt he will maintain that it may fall through, after all. Still I was assured by one of the leading owners today, on



FERRY BOAT PHILADELPHIA, BUILT AT ROACH'S SHIP YARD, CHESTER, PA., FOR THE PENNSYLVANIA RAILROAD CO.

allowances. Much has been said of the great showing of the Oregon on her run of last year from Puget Sound to Jupiter Inlet, when seventy-nine days were occupied in covering the distance of 14,511 knots at the speed of 7.65 knots per hour, and when seven stops were made varying from one to ten days. With these stops deducted the actual running time was nearly 1,230 hours or at a speed of 11.16 knots per hour. If allowance was made for stoppages and for slow running through the canal, the speed of the Solace would no doubt be much higher. As it is, her performance is one which shows great endurance of the ship and great steaming radius.

The Chesapeake & Ohio railroad is a very important factor in the upbuilding of Newport News, the city of America's greatest ship yard which is referred to at great length in this issue. The Chesapeake & Ohio has made Newport News the largest coal shipping port in the United States. This company is now handling annually between 2,000,000 and 3,000,000 tons of high-grade steam coal from the Kanawha and New River districts of West Virginia. The Chesapeake & Ohio Steamship Co. has the largest and best equipped line of ships in the Newport News-England service, the fleet including the Kanawha, Rappahannock and Shenandoah plying to Liverpool and the Greenbrier, Appomattox and Chickahominy plying to London. A great passenger patronage enjoyed by the C. & O. Co. between Cincinnati, Washington, Old Point Comfort and other points along the system is certainly deserved, as the service is the embodiment of perfection in all its appointments, and the scenery of the Blue Ridge mountain and Kanawha valley districts is among the finest to be found anywhere in the country.

whose judgment and information the utmost reliance may be placed, that "we are going to have a pool all right enough." Only one meeting has been held this week, when the agreement was completed as far as it could be with some of the interests unrepresented through absence from the city.

The Lehigh line has lost another good man in the appointment of Capt. James M. Todd assistant government inspector of hulls. Capt. Burns of the same line was made harbor master. Both are efficient shipmasters and the line is sorry to lose them.

The formation of big industrial institutions in this country and the development of ship building enterprises is attracting attention among leading representatives of similar institutions in France. Mr. George Bermond, representing the great works of Schneider & Co., Le Creusot, is just finishing a tour of the steel works of Pittsburg, Chicago and Lorain and is also visiting the principal ship yards. Jean Milius, another engineer who is here on a similar mission, represents Credit Lyonnais of Paris. He is one of some fifteen engineers who are employed constantly on investigations for that big financial institution. His inquiries pertain particularly to the steel combinations—Carnegie company, Federal Steel, American Steel & Wire, etc., but he is also making a general study of the resources of the country, more particularly as to possibilities in iron ore and coal, transportation facilities and manufacturing advantages.

The Chicago office of the Magnolia Metal Co. is now in the Fisher building, No. 281 Dearborn street.

PROBABLY NO INSPECTION FOR TOW BARGES.

General Dumont of the steamboat inspection service is of the opinion that tow barges of the lakes will not require inspection under the new law regarding sail vessels. He says in a letter to the Review:

"In reply to your letter of March 18, I have to inform you, tentatively, however, that it is my opinion that regular tow barges on the lakes, with sails to be used as auxiliary power only, would not be classed as sail vessels under the law 'concerning sail vessels of over 700 tons * * *.' The estimates of this office as to the number of sail vessels of 700 tons and upward that will require inspection for the Atlantic coast is 452, and the lakes 109."

Leading ship and engine building concerns, like the Neafie & Levy company of Philadelphia and the W. & A. Fletcher Co. of Hoboken, N. J., have of late been ordering safety hollow staybolts in large quantities from the Falls Hollow Staybolt Co. of Cuyahoga Falls, O. The high grade of material from which these staybolts are made, and the manner of making them, render them superior in testing qualities, and this, with their easy application, makes them the most economical bolt on the market.

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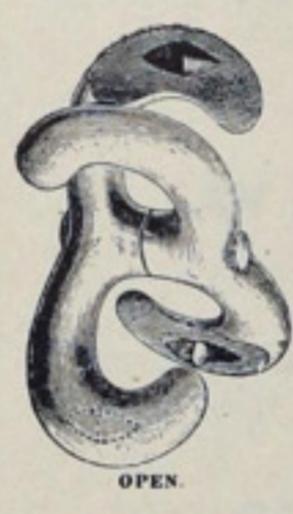
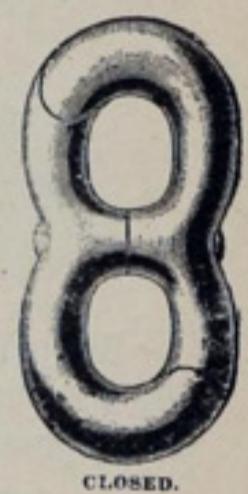
PIERS: 14 & 15 NORTH RIVER, FOOT OF FULTON ST., NEW YORK.

Although the Grant Machine Co. of Cleveland has been engaged in business for only seven months, they are now, and have been for some time, running their shops day and night. The company has been remarkably successful in introducing several improved designs of milling machines, lathes, screw machines, worm-wheel cutting machines, etc. An improved piston ring and cylinder head turning machine, for which great things are promised, will soon be placed on the market. A very neat catalogue has lately been issued.

The business of the C. H. Haeseler Co. of Philadelphia has been acquired by the National Pneumatic Tool Co. The new company is incorporated with a paid-in capital of \$200,000, and is installing new machinery to double the capacity of the plant. C. H. Haeseler is general manager of the company and G. B. Harris secretary.

Ten days stop-over at Washington—Tickets to Philadelphia and New York over Pennsylvania short lines may be obtained via Washington, and good for a ten days' visit at the national capital, at the same fare as apply to Philadelphia and New York over direct lines of Pennsylvania system. For further particulars apply to Pennsylvania lines ticket agents or address C. L. Kimball, passenger agent, Cleveland, O.

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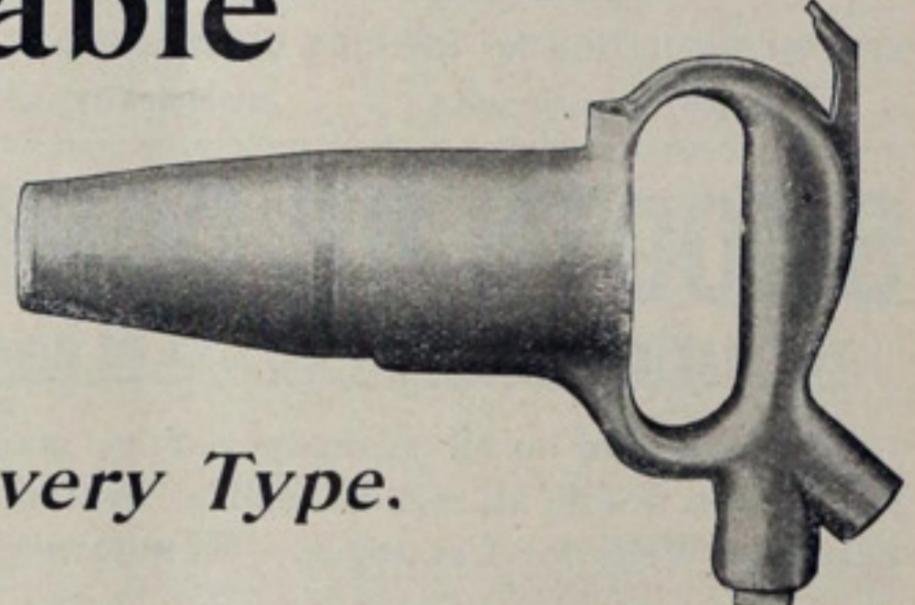
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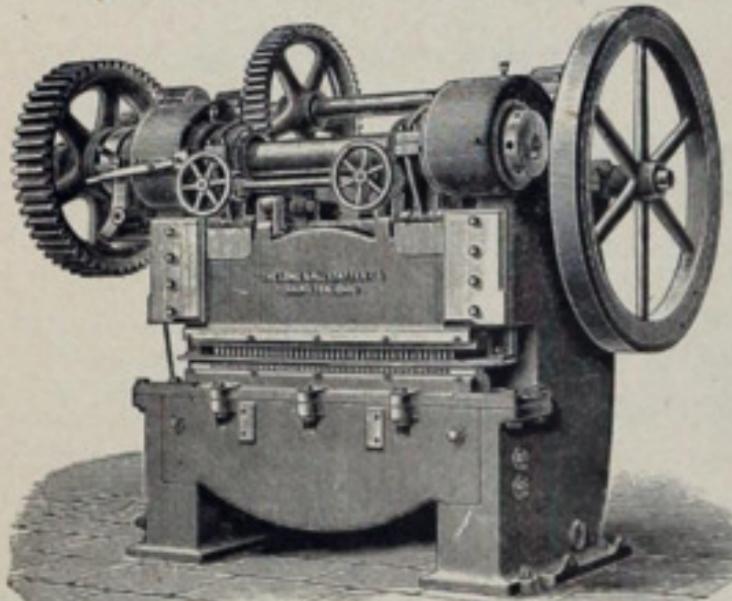


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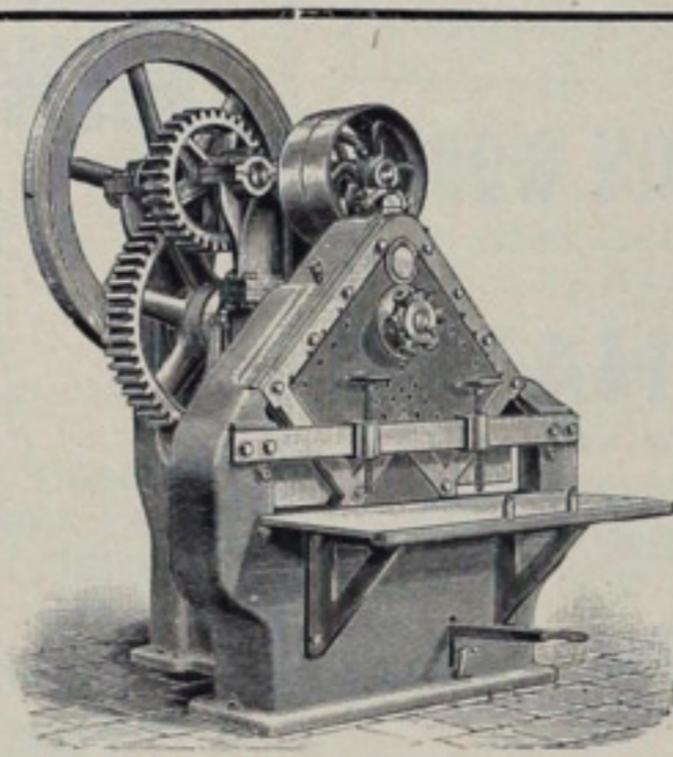
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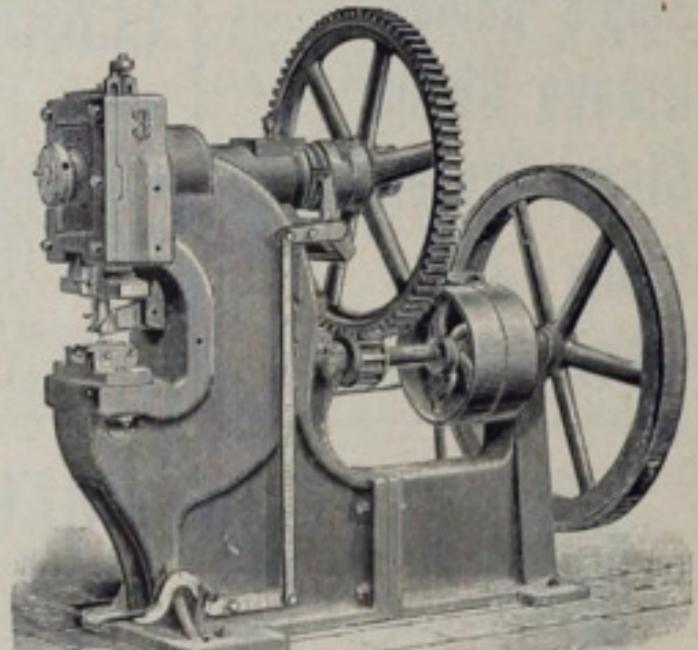
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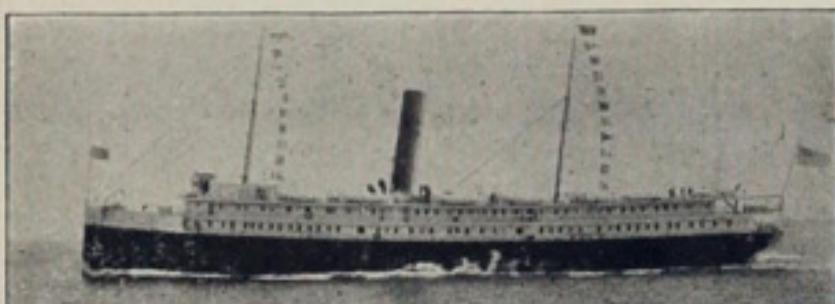
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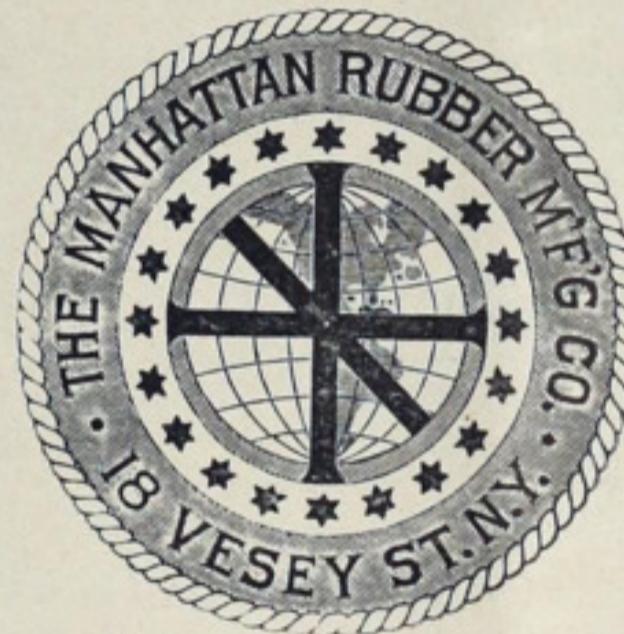
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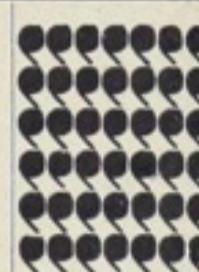
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